

RADIOLOGIC MANIFESTATIONS OF ODONTOGENIC TUMORS OF MESENCHYMAL ORIGINS*

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중배엽성 치성종양에 대한 방사선학적 연구

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국문초록

치성종양은 악구강계 영역의 질환중 중요한 관심거리가 되어왔으며, 이중 상피성 치성종양에 관한 보고는 많으나, 중배엽성 치성종양에 관한 보고는 많이 이루어지지 않았다.

저자는 1975년부터 1985년까지 서울대학교병원 치과진료부에서 방사선학적, 병리학적으로 중배엽성 치성종양인 치성섬유종, 치성점액종, 백악질형성섬유종으로 진단된 증례들을 토대로 하여 연구, 분석한 결과 다음과 같은 결과를 얻었다.

1. 치성섬유종의 연령분포는 32세에서 72세로 광범위 하였으며, 발생위치는 모두 상악구치부이었고, 단방선이 2증례, 다방성이 1증례 이었다.
2. 치성점액종의 연령분포는 40세에서 55세로 비교적 중년층에서 호발했고, 4증례가 상악에, 2증례가 하악에 발생하였다.
6증례 모두 방사선학적으로 다방성 방사선투과성을 보였으며, 경계는 비교적 불분명 하였다.
3. 백악질형성섬유종은 주로 청년에서 중년 성인 사이에 많이 발생하였고 40대에 가장 많은 출현율을 보였다. 남녀비는 약 1:2로 여자에게서 빈발하였다. 19증례중 하악에 15증례, 상악에 4증례가 발생하여, 하악이 호발부위였으며, 상하악 소구치, 대구치 부위에 발생하였다.
방사선학적으로 방사선투과성이 2증례, 혼합성이 12증례, 방사선불투과성이 5증례이였다.

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INTRODUCTION

Although odontogenic tumors are not common, they must be part of the differential diagnosis of maxillary and mandibular pathologic conditions.

Not only do these tumors differ histologically, they often reveal clues on radiographs that help in categorizing the lesions.

While epithelial odontogenic tumors have been recognized for a long time, little has been written about the possibility of pure tumors arising from the mesenchymal part of the tooth germ, the dental papilla, and the dental follicle.

The WHO established an International Reference Center for the Histological Definition and Classification of Odontogenic Tumors in 1966 at Copenhagen.

This was chiefly in recognition of the complexity of this group of tumors and an attempt to achieve international cooperation in discussion and dissemination of knowledge and ideas.¹⁰

The odontogenic tumors of mesenchymal origin classify peripheral odontogenic fibroma, odontogenic myxoma, central odontogenic fibroma, odontogenic fibrosarcoma, periapical cemental dysplasia, central cementifying fibroma, benign cementoblastoma, and dentinoma.¹⁰

The author studied and examined central odontogenic fibroma, odontogenic myxoma, and central cementifying fibroma, which frequently occurred in the jaws and had characteristic radiographic appearances.

MATERIALS & METHODS

The author observed radiographs which were diagnosed as central odontogenic fibroma, odontogenic myxoma, and central cementifying fibroma in the department of Oral Radiology and Oral Pathology, Seoul National University Hospital, from 1975 to 1985.

From the clinical records and radiographic informations; age, sex, location of the tumor, relation with adjacent anatomic structure, and radiographic appearances were evaluated.

RESULTS

1. Odontogenic fibroma

The age ranged from 32 to 72 years, and two were females and one was male. (Table 1).

Table 1. Age and sex distribution

Age	Sex
66	F
72	F
32	M

All the three cases of odontogenic fibroma occurred in the posterior portion of the maxilla (Table 2).

Table 2. Location of the tumors

1. Max.	Posterior area
2. Max.	Posterior area
3.* Max.	Posterior area

*Also involving the maxillary antrum

Of these three cases of odontogenic fibromas, one case showed displacement of the upper right first molar, invasion into the antrum, and cortical bone expansion (Table 3).

Table 3. Relations and effects on the adjacent anatomic structures

1. Negative
2. Negative
3. Displacement of <u>16</u> invasion into the antrum and cortical bone expansion

Two cases were unilocular pattern, and one case was multilocular pattern of bony destruction (Table 4).

One case showed cortical bone expansion and scalloped margin.

Table 4. Radiographic appearances

	well-defined	ill-defined
Unilocular	1	1
Multilocular	.	1

2. Odontogenic myxoma

In six cases of odontogenic myxomas observed by the author, the age ranged from 40 to 55 years.

Of six patients, four were females and two were males (Table 5).

Of six cases of odontogenic myxomas, four occurred in the maxilla, and two occurred in the mandible.

Of two cases occurred in the mandible, both cases occurred in the molar area involving the mandibular body and angle.

Of four maxillary lesions, one occurred in the anterior area, two occurred in the premolar

area, and one occurred in the molar area.

All the cases occurred in the tooth-bearing area (Table 6).

Table 5. Age and sex distribution

Age	Sex
55	M
49	F
40	M
42	F
43	F
42	F

Table 6. Location of the tumors

1. Max. anterior
2. Max. premolar
3. Max. premolar
4. Max. molar
5. Mand. molar
6. Mand. molar

In the maxillary odontogenic myxomas, displacement of sinus floor, invasion into the antrum with destruction of sinus walls were found and tooth displacement or root resorption was frequently found (Table 7).

Table 7. Relations and affects on the adjacent anatomic structures

1. Tooth displacement Displacement of sinus floor
2. Tooth displacement Invasion into the antrum
3. Root resorption Invasion into the antrum with destruction of antral wall
4. Invasion into the antrum with destruction of lateral wall
5. Negative
6. Negative

All six cases of odontogenic myxomas showed multilocular radiolucencies which were separated numerous septa, producing them honeycomb or tennis racket appearances. Five of these cases had ill-defined border.

Table 8. Radiographic appearances

	well-defined	ill-defined
Unilocular	.	.
Multilocular	1	5

3. Cementifying fibroma

The cementifying fibroma occurred more common in young and middle-aged adults with greatest incidence in the fifth decade. It is more common in females with the ratio of about 2:1 (Table 9).

Table 9. Age and sex distribution

Case	Age	Sex	Case	Age	Sex
1	46	M	11	25	M
2	46	F	12	47	F
3	7	M	13	11	M
4	41	M	14	12	M
5	15	M	15	39	F
6	41	M	16	28	F
7	66	M	17	31	M
8	36	M	18	28	F
9	48	F	19	9	F
10	16	M			

Of 19 cases of cementifying fibromas, 15 cases occurred in the mandible, and 4 cases occurred in the maxilla.

Of the mandibular lesions, 14 cases involved premolar and/or molar, and all the 4 cases of maxillary lesions occurred in the premolar and/or molar area (Table 10).

Table 10. Location of the tumors

Location	Man.	Max.
Premolar	4	1
Premolar-molar	3	1
Molar	4	2
Ramus	1	
Symphysis-molar	1	
Symphysis-condyle	1	
Premolar-ramus to the opposite side	1	
Total	15	4

Most of them (17 cases) showed cortical bone expansion, and the author could find tooth displacement in 10 cases, root resorption in 6 cases, and displacement of the mandibular canal in 6 cases.

In maxillary lesions, displacement of the sinus walls (2 cases) were found (Table 11).

Table 11. Relations and effects on the adjacent anatomic structures

Cortical bone expansion	17
Tooth displacement	10
Root resorption	6
Displacement of Man. canal	3
Displacement of sinus wall	2

Of 19 cases of cementifying fibromas, two cases were radiolucent type of early stage, twelve were mixed type of intermediate stage, and five were radiopaque type of mature stage.

Most of them (17 cases) were unilocular type, but two cases showed multilocular radiolucent type (Table 12).

Table 12. Radiographic appearances

Radiolucent type	2
Mixed type	12
Radiopaque type	5

DISCUSSION

The odontogenic fibroma, the odontogenic myxoma, and the cementifying fibroma, as the names imply, are benign odontogenic neoplasms occurring within the jaws. Based on their anatomic distributions and histologic appearances, these neoplasms are considered to be tumors of the mesenchymal components of the odontogenic apparatus: the periodontal ligament, dental papilla, or dental follicle.¹⁰

The odontogenic fibroma is a rare pathologic lesion and a central tumor of the jaws which is seen so infrequently that little is known about this neoplasm. Three basic concepts have postulated concerning this tumor¹⁰;

- 1) It is a lesion around the crown of an unerupted tooth resembling a small dentigerous cyst, although most investigators regard this as simply a hyperplastic dental follicle and not a true odontogenic tumor.
- 2) It is a lesion of fibrous connective tissue, with scattered islands of odontogenic epithelium bearing some resemblance to the dental follicle. However, because of its size it may attain the appearance of a neoplasm.
- 3) It is a lesion which has been described by the WHO as a fibroblastic neoplasm containing varying amounts of odontogenic epithelium and in some case, calcified material resembling

dysplastic dentin or cementum-like materials.

Gardner² has suggested that the tumor made up of connective tissue and odontogenic islands resembling dental follicle as the simple central odontogenic fibroma, and the WHO-type central odontogenic fibroma.

The odontogenic fibroma appears to occur more frequently in children and young adults, but the author observed three cases of odontogenic fibroma in older persons. The age ranged from 32 to 72 years, and such an age range may be the result of small number of cases and inadequate medical and dental facilities in some area.

In sex distribution, two were females and one was male.

Wesley and others¹⁶ found that the odontogenic fibroma has been reported as only occurring in the mandible. However, the author found that all the three cases of odontogenic fibroma occurred in the posterior portion of the maxilla.

The few reported cases of odontogenic fibroma have described root and tooth displacement, not resorption, that occurred with tumor enlargement.

Of these three cases of odontogenic fibroma, one case showed displacement of the upper right first molar, invasion into the antrum, and cortical bone expansion.

This tumor forms in the spongiosa of the bone and cause destruction of the bone trabeculae, forming a large cystic or polycystic defect.¹⁹

Two cases were unilocular pattern, and one case was multilocular pattern of bony destruction. In the case of invasion into the antrum, the tumor causes destruction of the sinus wall and opacification of the sinus cavity by the tumor mass.

The odontogenic myxoma is a rare tumor which occurs frequently in the jaws with almost universal absence in any other bone of the skeleton.²⁰

This tumor is a locally invasive neoplasm that recurs but does not metastasize.^{6,8} Stout¹³ says that only a myxoma metastasis to the heart has been reported in the medical literature.

In a review of the literature up to the year 1948, Stout¹³ found 10 cases of myxomas located in bone tissue. Despite the small number of bone myxomas, five cases occurred in the mandible, and three cases occurred in the maxilla.

Thoma,¹⁴ discuss in both the etiology and classification of the myxomatous lesions of the jaws, grouped these tumors into osteogenic and odontogenic types. According to the author, the odontogenic tumor is more common and is almost always benign.

Zimmermann and Dahlin²⁰ stated that among 2,276 primary tumors of bone, no myxoma could be found outside the facial skeleton.

Zimmermann and Dahlin,²⁰ Harris and others,⁷ Rao and Rao,⁹ and White and others¹⁷ say that myxomas affect males and females with almost equal frequency.

Of six odontogenic myxomas, four were females and two were males, but it is safe to say that this difference is not significant.

Shafer¹⁰ stated that it is unusual to find odontogenic myxoma in persons younger than 10 years or older than 50 years; almost 67% of the cases occurred between 10 and 29 years of age.

However, in six cases of odontogenic myxomas observed by the author the age ranged from

40 to 55 years, different from the many previous reports.

Thoma and Goldman¹⁴ stated that the odontogenic myxoma occurs almost exclusively in the tooth-bearing regions of the jaws.

Many previous reports do not agree with each other about the location of the odontogenic tumors. In the mandible, the angle of the jaw, the ramus, and the adjacent molar region are most commonly affected. In the maxilla, the zygomatic process and the alveolar bone that bears the molars and premolars are affected more often. The maxillary sinus can be involved by the tumor, especially when it is large.¹

By the author's examination, four cases occurred in the maxilla, and two occurred in the mandible. Of maxillary lesions, one occurred in the anterior area, two occurred in the premolar-molar area, and one occurred in the molar area. Of mandibular lesions, all the cases occurred in the molar area involving the mandibular body and angle.

All the cases occurred in the tooth-bearing area with the same result as Thoma and Goldman's study.

By the tumor mass, tooth displacement and root resorption are frequently found; in cases of maxillary lesions, the tumor may invade into the antrum, causing opacification of the sinus cavity and destruction of the sinus walls.

In the mandibular lesions, cortical bone erosion and expansion were found. By Thoma and Goldman¹⁴ nearly every case was associated with missing or embedded teeth. However, the author's examination revealed no relation with missing or embedded teeth.

This tumor produces the destructive and expansive nature.

It may be either unilocular or multilocular, although some describe it as typically multilocular, especially after it has been enlarged.¹¹

Although the locules are usually small and uniform with the typical honeycomb effect, the arrangement of the trabeculae may also suggest the tennis racket pattern. Often, exceptionally fine septa cross the radiolucent area, producing a wispy soap bubble appearance.^{3,4}

All the odontogenic myxomas observed by the author showed multilocular radiolucencies which were separated by the numerous septa formed square, rectangular, or triangular spaces, producing honeycomb or tennis racket appearances, and five of these cases had ill-defined borders.

Cementifying fibroma represent a definite entity which should be separated from fibrous dysplasia which do not represent true neoplasm.¹⁸

Waldron and Giansanti¹⁵ reviewed 65 cases of benign fibro-osseous jaw lesions that had been collected during 14-year period. Their two broad classifications included fibrous dysplasia (22 cases) and benign fibro-osseous lesions of periodontal ligament origin (43 cases).

They stressed the need for differentiation between the fibro-osseous lesions, which require excision, and fibrous dysplasia, which may require no surgical excision.

Cementifying fibroma is thought to be uncommon neoplastic processes that originate from elements in periodontal ligament.¹⁰

Hammer and co-workers⁵ explained that under a variety of stimuli, cells of the periodontal ligament are capable of producing lesions comprised of cementum, lamellar bone, fibrous tissue,

or any combination of these tissues.

Cementifying fibroma and ossifying fibroma represent the same basic neoplastic processes, the only difference being in the cells involved with their end products; cementum in one case, bone in the other.

Furthermore, many tumors in the general category are characterized by the presence of both types of cells. But probably the same progenitor cell, thus giving rise to the well recognized hybrid from the tumor, cemento-ossifying fibroma.¹⁰

The author's examination revealed the cementifying fibroma occurs more common in young and middle-aged adults, and has the predilection for occurrence in females with the greatest incidence in fifth decade and the sex ratio of 2:1, being coincident with the previous reports.

Most cementifying fibroma (15 cases) occurred in the mandible, usually located inferior to the premolars and molars, and only 4 cases occurred in the maxilla involving premolars or molars.

The cementifying fibroma represents an extremely variable radiographic appearance depending upon its stage of development.

In its early stage, or at least in one form of the disease, the cementifying fibroma appears as a radiolucent lesion with no evidence of internal radiopacities. As the tumor apparently matures, there is increasing calcification, so that the radiolucent area becomes flecked with opacities until, ultimately the lesion appears as an extremely radiopaque mass.^{3 4}

Most cases (12 cases) showed mixed type of intermediate stage, five cases were radiopaque type of mature stage, and only two cases were radiolucent type of early stage.

Most of them (17 cases) were unilocular type, but two cases were multilocular radiolucent type.

The border of cementifying fibroma is well-defined and hyperostotic, but sometimes the border is indistinct and ill-defined.

CONCLUSION

The author observed radiographs which were diagnosed as odontogenic fibroma, odontogenic myxoma, central cementifying fibroma in the department of Oral Radiology and Oral Pathology, Seoul National University Hospital, from 1975 to 1985.

The following conclusions were made.

1. Odontogenic fibroma

The age ranged from 32 to 72 years, and two were females and one was male. All the three cases occurred in the posterior region of the maxilla. Two cases were unilocular pattern, and one was multilocular pattern.

2. Odontogenic myxoma

The age ranged from 40 to 55 years, and four were females and two were males. Of 2 cases occurred in the mandible, both cases occurred in the molar area involving the mandibular body and angle.

Of 4 maxillary lesions, one occurred in the anterior area, two occurred in the premolar area, and one occurred in the molar area. All the cases showed multilocular radiolucencies, and most of them (5 cases) had ill-defined border.

3. Cementifying fibroma

The cementifying fibroma occurred more common in young and middle aged adults with greatest incidence in 5th decade. It is more common in females with the ratio of about 2:1. Of 19 cases, 15 cases occurred in the mandible, and 4 cases occurred in the maxilla. Of the mandibular lesions, 14 cases involved premolars and/or molars, and all the 4 cases of maxillary lesions occurred in the premolars and/or molar area.

Radiographically, two were radiolucent type of early stage, twelve were mixed type of intermediate stage, and five were radiopaque type of mature stage.

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EXPLANATIONS OF THE FIGURES

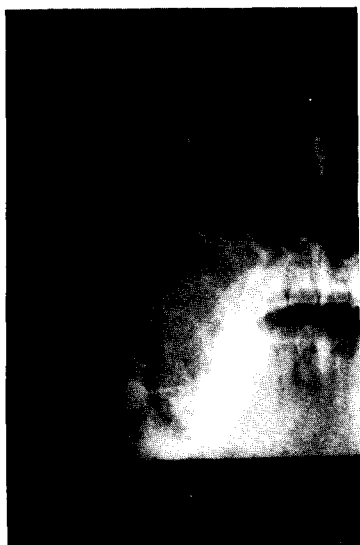


Fig. 1.

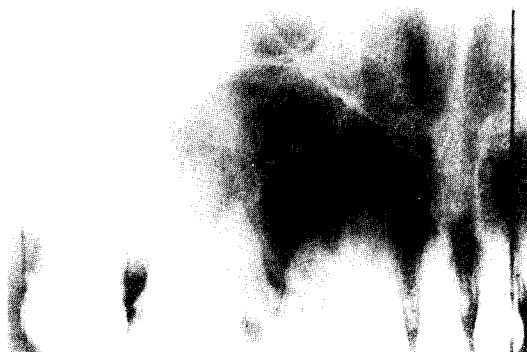


Fig. 2.



Fig. 3.

- Fig. 1. This radiogram shows odontogenic fibroma which invaded into the right maxillary sinus. The lateral wall of the sinus was destroyed and opacification of the sinus cavity is seen.
- Fig. 2. This radiogram shows odontogenic myxoma which occurred in the right maxilla. Irregular fine septa cross the radiolucent area and the border is ill-defined. Some tipping of the upper right 2nd premolar is seen.
- Fig. 3. This radiogram shows mixed type of cementifying fibroma which occurred in the right mandibular body. The radiopaque foci are scattered within the radiolucent area, and the border is well-defined and hyperostotic. The shape is round and the tumor has expanded the cortical plate.