AMELOBLASTOMAS – A CLINICOPATHOLOGIC STUDY OF 133 CASES IN PENINSULAR MALAYSIA

K. RAMANATHAN
PEACE INDRANI CHELVANAYAGAM
NG KOK HAN
JAYANTHI RAMANATHAN

SUMMARY

Ameloblastomas formed 1.1 percent of all oral pathology cases reported. The race, sex and age group distribution of 133 cases are shown. The peak age incidence (70.6 percent) was between 11 - 40 years. The mandible was involved 9 times more commonly than the maxilla. The anatomical sites of distribution, clinical and radiological features, histological variants and their correlation are discussed. Twenty two patients (15 percent) had ameloblastomas associated with a dentigerous cyst and/or unerupted teeth. Ameloblastomas with the above clinical features represented a much less aggressive form of neoplasm. The authors could not correlate histological variants of ameloblastoma with recurrence rates. The various treatment methods and the respective recurrence rates are outlined. Radiotherapy and marsupialization as treatment of ameloblastoma are not recommended. The indications for enucleation curettage, resection en bloc, segmental resection and hemimandibulectomy are emphasized. Ameloblastomas involving the maxilla should be treated by complete removal en bloc with a margin of normal tissue. Since ameloblastoma has the capacity to recur after several years of apparent cure patients who have been treated for ameloblastoma must be followed-up periodically during their life time. So far no case of ameloblastoma in this study has shown evidence of metastasis.

K Ramanathan, K.M.N., A.M. (Mal.), B.D.S. (S'pore), C.O.P. (Lond.), F.D.S.R.C.S. (Edin.), F.D.S.R.C.S. (Eng.) M.I.A.D.R., C.M.I.A.O.P., F.I.C.D., M.I.C.O.I., M.A.A.O.M., (USA), M.A.A.O.P. (USA)
Consultant Stomatologist & Head

Peace Indrani Chelvanayagam, B.D.S. (Mal.)
Dental Officer,

Ng Kok Han, B.D.S. (Mal.),
Dental Officer.,

Department of Stomatology,
Institute for Medical Research,
Kuala Lumpur. 03-19

Jayanthi Ramanathan, B.D.S., Ph.D.
Visiting Fellow from Dental School,
Faculty of Medicine,
Unversity of Peradeniya,
Sri Lanka.

INTRODUCTION

The ameloblastoma is a true neoplasma of the enamel organ-type tissue which does not undergo differentiation to the point of enamel formation. Several electron microscopic studies of the ameloblastoma have been carried out.[1,2,3,4] These studies have reported that the fine structural appearances of the tumour epithelium resembled those of the inner enamel epithelium.

Ameloblastoma forms about 1 percent of the tumours and cysts seen in the area of the maxilla and mandible. [5] Regezi *et al* [6] in reporting 706 cases of odontogenic tumours found that ameloblastoma formed 11 percent. The ameloblastoma appears to arise from several possible origins. Thus the tumour conceivably may be derived from: (1) cell rests of the enamel organ, either remnants of the dental lamina or remnants of Hertwigs' sheath, the epithelial rests

TABLE I
DISTRIBUTION BY RACE, SEX AND AGE GROUPS OF
133 PATIENTS WITH AMELOBLASTOMA (1967-1980)

AGE GROUP (YEARS)	MALAYS		CHINESE		INDIANS		TOTAL	PERCENTAGE
	M	F	M	F	M	F		
0-10	-	-	-	1	1	-	2	1.5 %
11-20	9	5	11	8	-	-	33	24.8 %
21-30	2	9	7	6	4	-	28	21.0 %
31-40	9	13	5	3	3	-	33	24.8 %
41-50	2	6	4	3	0	-	15	11.3 %
51-60	5	2	5	1	1	2	16	12.0 %
61-70	1	-	3	-	-	-	4	3.0 %
71-80	-	-	1	-	-	-	1	0.8 %
81-90	-	1	-	-	-	-	1	0.8 %
TOTAL	28	36	36	22	9	2	133	100.0 %
Percentage	21.0	27.1	27.1	16.5	6.8	1.5		100.0%
M:F	0.8:1		1.6:1		4.5:1		1.2:1	

of Malassez; (2) epithelium of odontogenic cysts, particularly the dentigerous cysts and odontomas; (3) disturbances of the developing enamel organ and (4) basal cells of the oral mucosa.[7] The histological pattern of ameloblastoma varies greatly and the following types or variants are commonly described: (1) follicular, (2) plexiform, (3) acanthomatous (4) basal cell type and (5) granular cell type.[8]

MATERIALS AND METHODS

This study was based on the records of the Department of Stomatology, Institute for Medical Research, Kuala Lumpur and for the period 1967-1980. Only histologically confirmed ameloblastoma cases and patients reported for the first time were included in this study. In all there were 133 patients. The total number of oral pathology cases reported during this period was 12,110. Thus ameloblastoma formed 1.1 percent of all oral pathology cases reported.

RESULTS AND DISCUSSION

The distribution of ameloblastomas by race and sex and descending order of frequency was Chinese male (27.1 percent), Malay female (27.1 percent), Malay male (21.0 percent), Chinese female (16.5 percent), Indian male (6.8 percent) and Indian female (1.5 percent) (Table I.) Thus ameloblastomas appear to be relatively most frequent in the Chinese male and in the Malay female and rare in the Indian female. Although the overall male:female (M:F) ratio showed an approximately equal distribution between the sexes (M:F = 1.2:1) in the Indians however the male predominance was rather striking (4.5:1). Our overall M:F ratio is about the same as Small and Waldron's [5] analysis of 1036 cases from the literature (1.1:1). Our youngest patients were a Chinese girl and an Indian boy aged 10 years and the oldest patient was a 90 year-old Malay female. The average age at the time of reporting to hospital was 34 years. The average duration of the tumour was 2 years. The peak age incidence (70.6 percent) was between 11-40 years thus indicating a rather younger age group than that reported by Small and Waldron [5] who found that most patients were between 20-50 years.

The mandible was involved 9 times more commonly than the maxilla. When compared to Small and Waldron's [5] figures (4.3:1) it would appear that in Malaysians maxillary involvement of ameloblastoma is relatively less common. In descending order of frequency the mandibular bicuspid-molar-ramus area (74.5 percent), the mandibular incisor-canine region (19.4 percent), the maxillary bicuspid-molar area (4.9 percent) and the maxillary incisor-canine region (1.2 percent) were involved (Fig. 1). In descending order of frequency the mandibular incisor-canine region most frequently involved the Malay female (37.5 percent), Malay male (21.9 percent), Chinese female (18.8 percent), Chinese male (15.6 percent), Indian male (3.1 percent) and the Indian female (3.1 percent). The left side of the mandible was 1.5 times more commonly involved than the right side.

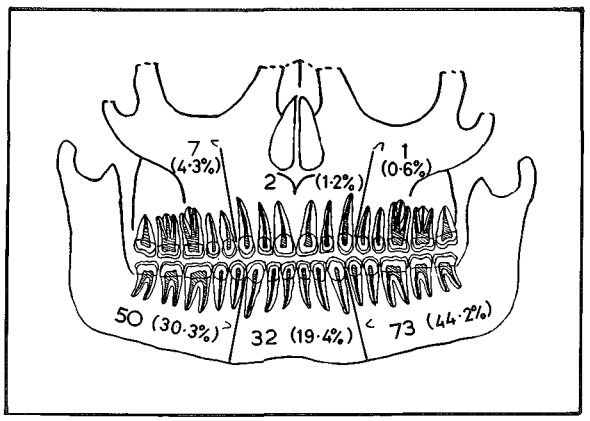

Fig. 1 Shows the anatomical distribution of ameloblastoma in 133 patients. (1967 - 1980). In some patients the tumour extended to involve more than one anatomical site.

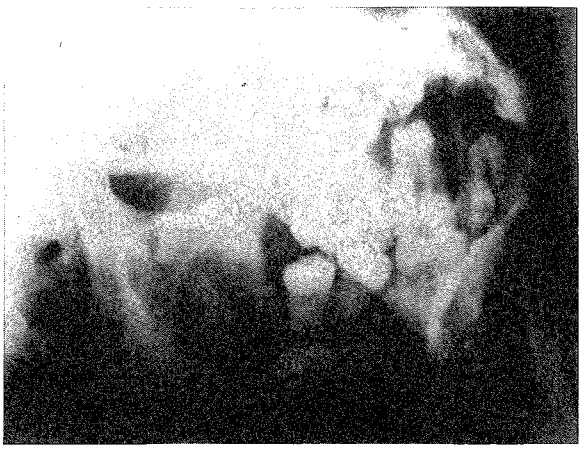

Fig. 2 Shows a lateral oblique radiographic - view of the mandible in which the ameloblastoma presents as a unilocular lesion.

The clinical features seen were swelling (50.5 percent), expansion of buccal cortical plate (11.4 percent), evidence of fluctuation (11.0 percent), evidence of cystic fluid (10.3 percent), expansion of the lingual cortical plate (7.5 percent), mobile teeth (5.0 percent), displaced teeth (2.1 percent) and ulceration of the oral mucosa (2.1 percent). The radiological features seen were a multilocular lesion (37.4 percent), a unilocular lesion (20.9 percent), a radiolucent lesion with no further detailed description of the features (18.6 percent), displaced teeth (14.3 percent) and evidence of root resorption (8.8 percent). The clinical diagnosis were ameloblastoma (56.3 percent), radicular cyst (13.5 percent), dentigerous cyst (7.9 percent), fibro-osseous lesions (5.5 percent), carcinoma (4.8 percent), primordial cyst (4.0 percent) and pyogenic granuloma (2.4 percent).

In ten patients (7.5 percent) ameloblastoma presented clinically as dentigerous cysts. All the patients were below 40 years. In descending order of frequency they occurred most commonly in the Malay male (30 percent), Malay female (30 percent), Chinese male (30 percent) and in the Chinese female (10 percent). No case was reported in the Indians. The mandibular third molar was the mandibular second molar (22 percent). Another ten patients (7.5 percent) had ameloblastomas associated with unerupted teeth. Of this group of patients the youngest were two Chinese boys aged 11 years and the oldest was a Chinese female aged 33 years. Again the commonest tooth involved was the mandibular third molar followed by the mandibular bicuspids. Our observations further substantiate Stanley and Diehl's [9] finding that approximately (17 percent) of ameloblastomas were definitely associated with an impacted tooth and or a dentigerous cyst. Like the above authors we also noted a marked reduction in the prevalence of such cases after the age of 30 years presumably because of the loss of the ameloblastomatous potential of the odontogenic epithelium in unerupted tooth follicles and dentigerous cysts as patients age.

The above findings emphasize the need to distinguish between ameloblastomas and dentigerous cysts and especially when they involve the mandibular molars and bicuspids. Because there is no other absolute way of making a diagnosis of ameloblastoma like other authors, [7,10,11,12,13,14,15,16,17] we too wish to emphasize the need for careful histologic examination of the lining of all odontogenic cysts. Unlike Sehdev *et al* [15] we found an association of ameloblastoma with primordial cyst in a 35 -year-old Malay male. The lesion involved the left ramus of mandible.

The histological variants seen in our study are summarized in Table II. The follicular pattern and the acanthomatous type occurred most commonly in the Malay female and Chinese male. The plexiform pattern and the combination of follicular and plexiform type were seen most often in the Chinese male and in the Malay male and Malay female. The granular cell type was reported in two Malay females, a Chinese male and in a Chinese female. The only case of basal cell ameloblastoma-type was reported in a Chinese female.

TABLE II
DISTRIBUTION OF 133 CASES OF AMELOBLASTOMA BY HISTOLOGICAL VARIANTS

Histological Variants	Total	%
FOLLICULAR	49	36.8 %
PLEXIFORM	34	25.6 %
ACANTHOMATOUS	23	17.3 %
FOLLICULAR & PLEXIFORM	22	16.5 %
GRANULAR CELL	4	3.0 %
BASAL CELL	1	0.8 %
TOTAL	133	100.0 %

An attempt was made to correlate the histological variants with the radiological features seen. In the ameloblastomas showing multilocular radiological features the histological variants seen in descending order of frequency were: follicular pattern (35 percent), mixed follicular and plexiform pattern (21 percent), acanthomatous pattern (21 percent) and plexiform pattern (18 percent). In the ameloblastomas showing unilocular radiological features the histological variants seen in descending order of frequency were: plexiform pattern (53 percent), follicular pattern (32 percent) and the acanthomatous pattern (11 percent). Surprisingly no mixed follicular and plexiform pattern was seen in the ameloblastoma cases which demonstrated a unilocular radiological feature.

An attempt was also made to correlate the histological variants with age and clinical features. Both the youngest patients aged 10 years had the plexiform variant of ameloblastoma. The only case of basal cell type of ameloblastoma was seen in a 14-year-old Chinese girl. Below the age of 20 years the commonest histological variant seen was the plexiform type (59 percent). Between 21 - 40 years the histological variants seen in descending order of frequency were the follicular pattern (39 percent), acanthomatous variant (22 percent), plexiform type (20 percent) and the mixed follicular and plexiform pattern (15 percent). Above 40 years the commonest histological variants seen in descending order of frequency were the follicular type (43 percent) and the acanthomatous variant (29 percent). The peak age incidence for the acanthomatous ameloblastoma was between 21 - 50 years (75 percent). Our study therefore did not support the view that acanthomatous ameloblastoma was more often associated with the older age groups.

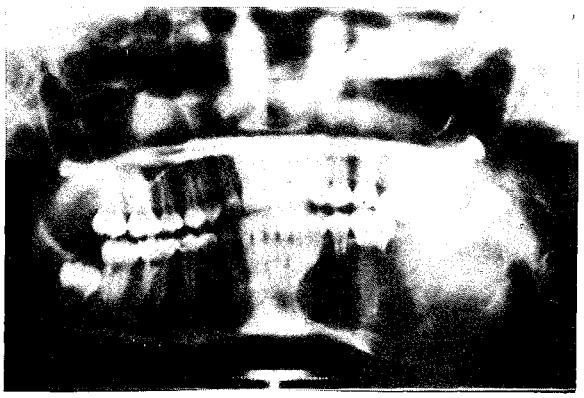

Fig. 3 Shows an orthopantomograph of the mandible. The ameloblastoma presents as a multilocular lesion on the left side with evidence of resorption of the roots of the second bicuspid and first molar and displacement of the second and third molars.

Buccal bony expansion (a) and lingual or palatal bony expansion (b) were most commonly noted in the follicular ameloblastoma (a-33 percent; b-41 percent). Bony hard swelling was most frequently seen in the plexiform ameloblastoma (45 percent) and in the follicular ameloblastoma (32 percent). Fluctuation was most often noted in the follicular ameloblastoma (35 percent) and in the plexiform ameloblastoma (29 percent). Cyst fluid was aspirated most commonly in the follicular ameloblastoma (38 percent). Mobile teeth were most commonly associated with the plexiform ameloblastoma (50 percent).

An attempt was also made to correlate the histological patterns with anatomical sites. In the symphysis of the mandible the follicular pattern (26 percent) and the acanthomatous variant (25 percent) occurred slightly more frequently and the plexiform pattern (10 percent) less commonly than the average distribution of all histological types of ameloblastoma.

TREATMENT

Table III shows the various treatment methods carried out in our study and the respective recurrence rates. Although an attempt was made we have not been successful however in correlating histological variants of ameloblastoma with the recurrence rates. Treatment methods and clinical features seem to have the final say with

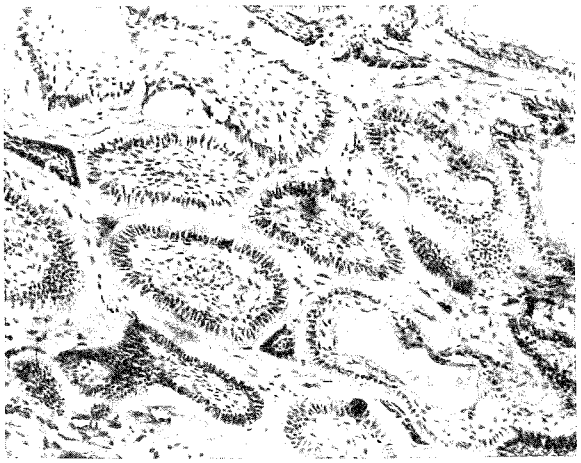

Fig. 4 Shows the follicular pattern of ameloblastoma consisting of islands of odontogenic epithelium comprising an outer row of tall columnar cells and an inner core of stellate reticulum - like cells. The columnar cells show evidence of nuclei being orientated away from the basement membrane. Intra-epithelial cystic degeneration is also present. Orig. Mag x 40. H & E.

TABLE III
TREATMENT METHODS EMPLOYED AND RECURRENCE RATES*

Treatment	Total No.	No. of Cases Recurred	%
Enucleation	36	7	19.4 %
Hemimandibulectomy or Hemimaxillectomy	15	3	20.0 %
Curettage	13	3	23.1 %
Resection Enbloc/ Segmental	13	3	23.1 %
Marsupialization	9	6	66.7 %
Radiotherapy	1	1	100.0 %
	87**	23	

* Period of observation varied from 10 months to 15 years.

** In 57 patients the available data on treatment was inadequate for the above study. In some patients more than one method of treatment were employed.

regard to recurrence. The period of observation varied from 10 months to 15 years. Two patients had two recurrences. A Malay female was first treated with marsupialization. Three years later she was treated for a right hemimandibulectomy. Seven years later the recurring neoplasm had extended to involve the parapharyngeal space and the right infratemporal fossa region. At this operation curettage was done. The second patient was a Malay male on whom enucleation, enucleation and curettage and enucleation of the tumour was done and over a period of four years. Only one Malay female had three recurrences. The tumour was marsupialized thrice and on subsequent recurrence it was enucleated. The four operations were done over a period of 14 years. All the other 20 patients included in Table III had one recurrence. Treatment of ameloblastoma is still clouded with controversy. [18,19] In the light of our experience we shall spell out the indications for the various types of treatment carried out in ameloblastoma cases.

Our experience not only with the one case included in this study but also two other cases not included in this study and treated by megavoltage therapy would indicate like Sehdev *et al* [15] observations that radiotherapy is not a form of treatment for ameloblastoma. Furthermore other authors [20,21,22,23] have emphasized that radiotherapy seems to increase the risk of ameloblastoma cases metastasizing to other parts of the body. Marsupialization had a high rate (67 percent) of recurrence. Such treatment is also not recommended.

In the very young where the ameloblastoma lesion is small, we would recommend, as would some other workers, [24,25,26,27] a conservative form of treatment such as enucleation or curettage. We would also recommend such treatment for ameloblastomas involving the mandible and which present the monolocular radiological appearance. Enucleation would also seem to be adequate for those cases of ameloblastoma which radiologically and clinically present as dentigerous cysts and or as cysts associated with unerupted teeth. The average age of the 20 patients who presented with the above features in our study and at the time of operation was 19 years. Recurrence occurred in 3 cases. In two patients the cysts had earlier been marsupialized. In the third case recurrence occurred 7 years after enucleation. Our experience would substantiate the observations of Robinson and Martinez [16] and McMillan and Smillie [17] that ameloblastomas which presented as dentigerous cysts and or cysts associated with unerupted teeth represent a much less aggressive form of the neoplasm and that their rate of recurrence is distinctly lower than that of the multicystic and solid variants.

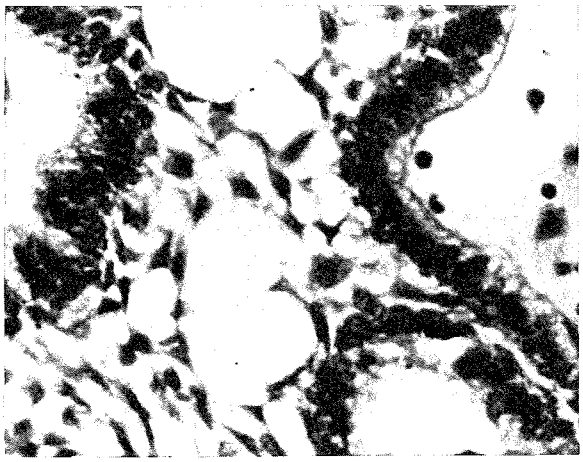

Fig. 5 Shows the plexiform variant of ameloblastoma. The outer row of cuboidal cells show orientation of the nuclei away from the basement of membrane. Intra epithelial cystic degeneration is present. Orig. Mag. x160. H & E.

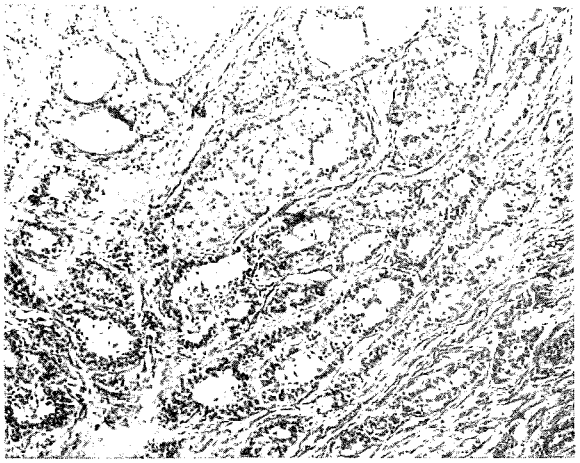

Fig. 6 Shows the granular cell ameloblastoma. It consists of follicles of odontogenic epithelium with a central core of large, round or polyhedral cells and which have an eosinophilic granular cytoplasm. The nuclei are generally pyknotic and eccentrically displaced. The cells are PAS - positive. Orig. Mag. x25. H & E.

In cases of ameloblastoma of the mandible presenting with a multilocular radiological appearance and where the lower border of the mandible can be preserved resection [15,19,21,26,28,29] en bloc would seem to be the treatment of choice. Where the ameloblastoma extends to involve the lower border of the mandible but still remains as a small lesion segmental resection with a one-stage iliac crest bone graft is recommended. Where the ameloblastoma is a large lesion involving the mandible and presenting with a multilocular radiological appearance radical surgery such as hemimandibulectomy with a one-stage iliac crest bone graft would be the treatment of choice.

In recurrent lesions of the mandible since repeated operations like radiotherapy seem to increase the risk of metastasis [15,20,21,22,23,30] a more aggressive form of surgery is indicated.

In cases of ameloblastoma involving the maxilla because of the risk of recurrences extending to involve the base of the skull [15,19,,28] we would consider the only rational treatment would be complete removal, en bloc, with a margin of normal tissue. Depending on the size of the tumour this treatment could be a partial maxillectomy, a hemimaxillectomy or even a more extensive form of surgery.

CONCLUSION

Like Gardner and Pecak [19] we too advocate that further studies on the treatment of ameloblastomas with enucleation or curettage followed by cryotherapy with a long-term follow-up may prove valuable. This subject has been discussed in detail by Marciani *et al.* [31] Our cases so far have not shown any evidence of metastasis. Since ameloblastoma has the capacity to recur after several years of apparent cure patients who have been treated for ameloblastoma must be followed-up periodically during their life time.

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