AMELOBLASTOMA OF THE JAWS IN KORLE-BU TEACHING HOSPITAL, ACCRA: ANALYSIS OF 48 CASES.

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SUMMARY
The clinico-pathological data of forty-eight patients with ameloblastoma of the jaws seen in Korle-Bu Teaching Hospital, Accra, Ghana over a 10-year period are reviewed. The higher frequency of ameloblastomas in this environment appears to exert a great influence over the incidence of odontogenic tumors in general. There appears in this study to be a linear relationship between the anterior location of the tumor and the age of the patient and this, it is being suggested here, may be of aetiological significance. Total resection of the tumor with an adequate margin of healthy bone followed by simultaneous bone grafting remains the main choice of treatment. However, the principle of selective conservative surgical treatment by marginal resection when carefully applied offers the best result and is to be given first consideration wherever possible.

INTRODUCTION
The jaw tumour referred to as ameloblastoma or adamantinoma is said to be the commonest type of tumour arising from odontogenic epithelium and also constitutes the commonest jaw tumour found in Africans. This tumour was first described by Falkson in 1879. Ever since then, it has generated so much controversy that till date it is still difficult to find investigators who will agree completely on the classification, cell of origin, clinical behavior and treatment of this tumor. For instance, whereas Pindborg[11] states that an ameloblastoma should be called malignant only if it demonstrates metastasis, Gorlin[5] advocates that tumors with malignant histologic features should be classified as malignant ameloblastoma or ameloblastic carcinoma.

The diversity of opinion concerning this tumour was highlighted by Smith,[2] when he stated that few tumors have attracted as much attention or presented as great a challenge to the pathologist and clinician as the ameloblastoma. He then went further to reveal no less than 27 contrasting statements concerning ameloblastomas in various papers. This confusion, according to Mehlisch et, al,[3] has arisen partly due to the many different names used in describing this tumor in the past; and partly due to the fact that much of the literature concerning it has included tumors of widely divergent behavior such as craniopharyngioma, the so-called adamantinoma of long bones, adenameloblastoma, ameloblastic fibroma, and even melanameloblastoma.

The term ameloblastoma, indicating that the tumor arises from the epithelium of the enamel organ, and which at present seems the most appropriate, was introduced in 1930 by Churchill and Ivy.[1] However, objections are still voiced out against the name. For example, Gorlin[5] stated that “the term ameloblastoma appears to be ill-chosen since no evidence suggests origin from the ameloblast.” Despite publications of excellent reviews and diagnostic criteria of this tumor more recently, there still appears in the literature, controversies about its aetiology, clinical behaviour and treatment amongst others. In addition, though several publications can be found in the literature from Nigeria and other parts of Africa about this tumour, none appears, so far, to originate from Ghana. The aim of this study therefore, is to analyze all cases diagnosed as ameloblastoma that have presented at the Korle-Bu Teaching Hospital (KBTH) over a 10 year period, (1988-1997) with the view to finding out further information about this tumor. It is hoped that this would further elucidate the controversy surrounding this tumor.

MATERIALS AND METHOD
The materials studied were obtained from 48 cases of histologically diagnosed ameloblastoma presenting for treatment at the Dental department of
the Korle-Bu Teaching Hospital, from 1987 to 1997. All the patients studied were Ghanaian. Twenty-eight of the patients were studied personally by one of us, while the case records and x-rays of the remaining twenty patients were reviewed. Additional information was garnered from the files of the Department of Pathology. There were no significant difficulties encountered with data collection. Initial diagnoses of all the cases were based on their clinical presentations coupled with their radiological appearances while histological studies were based on biopsy and surgical specimens. All the specimens were examined grossly and fixed in 10% formal saline solution. Processing included decalcification, paraffin sections and staining with haematoxylin and eosin for histological examination. Diagnosis was based on the finding of a tumor usually with cystic areas and epithelial islands showing a central loose network of cells resembling stellate reticulum and covered by tall columnar cells with polarization of the nuclei away from the basement membrane. Lesions not meeting the defined histological criteria for diagnosis of ameloblastoma, as stated above, were excluded from the study.

RESULTS

Incidence

During the 10-year period under review a total of 1,547 biopsies were recorded for all types of tumor involving the head and neck region at the Korle-Bu Teaching Hospital. Of this number, 255 were tumors of salivary glands, oral cavity, jaws and maxillary sinuses, out of which 97 were odontogenic tumors and cysts. Forty-eight (48) or slightly less than half of the odontogenic tumors and cysts were ameloblastomas; thus, the relative ratio frequency of this tumor in KBTH from this study is 49.5% of all odontogenic tumors and cysts, 11.2% of all oral and maxillofacial tumors and 3.1% of all lesions undergoing biopsy from the head and neck region.

Sex and Age

In this survey, ameloblastoma was found to be more common in men than in women. Thirty-one cases or 64.6% of the study sample were males and 17 cases or 35.4% female, thus giving a male to female ratio of approximately 2:1. The youngest patient in this study was a 12 year old female while the oldest was 64 year old male, giving an age range of 12-64 years. The average age at the time of biopsy or treatment was 26.7 years for females, 31.9 years for males and 29.4 years for all cases. The declared duration of the tumor, by the patients prior to consultation, varied from four months to 15 years, with an average of 2.8 years. The peak incidence was between 10 and 30 years. Three patients, one male and two females, could not specify their ages. Table 1 shows a summary of the actual number of cases in each age group.

<table>
<thead>
<tr>
<th>Age range (years)</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 10</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>11 – 20</td>
<td>10</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>21 – 30</td>
<td>6</td>
<td>9</td>
<td>15</td>
</tr>
<tr>
<td>31 – 40</td>
<td>3</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>41 – 50</td>
<td>5</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>51 – 60</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>61 – 70</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>All ages</td>
<td>28</td>
<td>17</td>
<td>45</td>
</tr>
</tbody>
</table>

No ages were specified for one male and two females.

Site and distribution

In all the cases studied, the tumor was located in the mandible. No cases were recorded in either the maxilla or peripherally. In other to present the site incidence of the tumor, the mandible was arbitrarily divided into 5 areas in line with the scheme proposed by Akinosi and Williams. Based on this, as shown in table 2, in the 45 cases where the patients' ages were specified, the tumor was located mainly in the anterior part of the mandible (symphyseal) in 24 cases representing 53.3%. In 15 (33.3%), the tumor was located mainly in the mandibular molar region. Only in 2 cases or 4.4%, was the tumor located in the ramus region. In four (8.9%) of the cases reviewed, the location was not specified.

Site variation according to age

Ameloblastoma has been shown to be preponderant in the young. An attempt was made in this study to establish if there is any correlation, whatsoever, between the age of the patient and the location of the tumor. As shown in Table 2, of all the 15 cases in the age group 20 years and below, the tumor was located in the symphyseal region in 12 or 80% and in the molar region in 3 (20%) of them. In none of the cases in this age group was the tumor located in the mandibular ramus region. Of the 15 cases in the age group between 21 and 30 years, 4 (26.7%) were located in the anterior mandible, 8 (53.3%) in the molar region and 1 or 6.7% in the ramus region. In 2 (13.3%) of the
cases in this age group, the exact location of the tumor was not specified. The 31-40 years age group showed 3 (75%) of the 4 cases in this age group having the tumour located in the anterior region, 1 (25%) in the molar region, and none in the ramus of the mandible. Between the ages of 41 and 50 years, 2 (28.6%) of the 7 cases in this age group were anteriorly located, 3 (42.8%) were located in the molar region while 1 or 14.3% were located in the ramus region. In one patient in this age group (14.3%), the location was not specified.

Of the 3 cases in the 51-60 years group, in 2 or 66.7% the tumour was located in anterior mandible, none in the molar and ramus regions. In one or 33.3% the location was not specified. Only one case was seen in the 61-70 years age group and in this case, the tumour was located in the mandibular ramus region. The incidence of anterior (symphseal) tumours as seen in this study, thus appears to decrease with age.

Clinical features and diagnosis
The clinical features and radiological appearances of the tumours in this study mostly duplicates that already reported in the literature. The tumors were mostly large in size and typically located in the anterior region with both lingual and labial expansions as seen in Figure 1.

Resorption of the apices of teeth involved in the tumour was found to occur commonly on the radiographs. Forty-two or 87.5% of the cases studied were correctly diagnosed clinically, whereas the remaining 6 cases or 12.5% were diagnosed clinically as dentigerous cyst. In the list of differential diagnosis, the dentigerous cyst topped the highest index, followed by other non-specific cysts. Others were odontogenic tumour, squamous cell carcinoma, myxoma and fibrous dysplasia in that order.

Histologic typing
According to Shafer, ameloblastoma may be classified into five histological types, as follows: Plexiform, follicular, acanthomatous, basal cell and granular types. Various studies have however not shown any correlation between the tumor sub-

<table>
<thead>
<tr>
<th>Location of tumour</th>
<th>10-20yrs (12/80)</th>
<th>Age Group</th>
<th>21-30 yrs (26.7)</th>
<th>31-40yrs (75)</th>
<th>41-50yrs (28.6)</th>
<th>51-60yrs (66.7)</th>
<th>61-70yrs (100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symphseal</td>
<td>3 (25)</td>
<td>1 (25)</td>
<td>2 (28.6)</td>
<td>2 (66.7)</td>
<td>1 (100)</td>
<td>24 (53)</td>
<td></td>
</tr>
<tr>
<td>Molar area</td>
<td>0</td>
<td>1 (6.7)</td>
<td>1 (14.3)</td>
<td>0</td>
<td>0</td>
<td>15 (33)</td>
<td></td>
</tr>
<tr>
<td>Ramus area</td>
<td>0</td>
<td>2 (13.3)</td>
<td>1 (14.3)</td>
<td>0</td>
<td>0</td>
<td>2 (4)</td>
<td></td>
</tr>
<tr>
<td>Unspecified</td>
<td>0</td>
<td>2 (13.3)</td>
<td>0</td>
<td>1 (14.3)</td>
<td>1 (33.3)</td>
<td>0</td>
<td>4 (9)</td>
</tr>
<tr>
<td>Total</td>
<td>15 (100)</td>
<td>15 (100)</td>
<td>4 (100)</td>
<td>7 (100)</td>
<td>3 (100)</td>
<td>1 (100)</td>
<td>45 (100)</td>
</tr>
</tbody>
</table>

No ages were specified for three cases

![Figure 1](https://example.com/image1.png)

Figure 1 Photograph of patient with ameloblastoma of the mandible

[type and either its aggressiveness or treatment. In the KBTH, the term ameloblastoma was simply used as the diagnosis in most cases. These descriptive terms were not used routinely, except in a few cases. In KBTH there was no case of metastasis or malignant histological features reported or described. There was therefore no diagnosis of malignant ameloblastoma made over the period. Only 6 cases were diagnosed as arising from a dental cyst or associated with a cyst.

Treatment
Of the 48 cases seen and studied at the Korle-Bu Teaching Hospital over the period, only 28 of them were seen, treated and followed up by this author. Hence, only the treatment of these 28 patients is analyzed in this paper. Six of them were treated by enucleation and curettage simply because they were clinically diagnosed as dentigerous cysts. In all six cases, the tumour recurred between 1 to 2 years. Fourteen cases were treated by marginal mandibular resection sparing the lower margin of the mandible. In only three of these cases did the tumour recur after periods 2 to 4 years. The remaining eight patients were treated by
wide mandibular resection with only one recurrence after a time lapse of 4 years. In these cases, Kirschner wire was fashioned out and inserted into the wound to minimize the ensuing deformity and also maintain the graft bed for future bone grafting. These wires, in two cases were removed as a result of postoperative infection. Simultaneous autogenous bone grafting was not carried out in any of them and none of them was treated by radiation. Inter maxillary fixation was carried out for various periods of time ranging from 2-6 weeks in cases of semi-mandibulectomy to allow for complete wound scarification. This was found to be helpful in minimizing the deviation of the jaw.

Most patients were quite satisfied with the results of the surgery and the only complaint usually presented was pain either due to infection or impingement of the Kirschner wire on soft tissues. Postoperative x-rays were taken routinely at six monthly periods during follow-up reviews. This practice proved very useful in helping to detect recurrences of the tumour early in the few patients cited. Interestingly, very few patients kept appointments for the purpose of replacing implants with bone grafts. Most of them declined further surgery in the absence of recurrence.

DISCUSSION

The relative frequency of ameloblastoma in this study is 11.2% of all oral and maxillo-facial tumors recorded at the KBTH. This appears higher than those recorded in Europe and the USA. For instance, in the review of a large series by Small and Waldron they ameloblastoma formed only 1% of all tumors in the oral cavity. Similarly, Bhaskar analyzed over 20,000 cases in which ameloblastoma formed only 1.62% of all tumors of the oral cavity. On the other hand, they do not deviate very much from others reported in Nigeria and other parts of Africa. For example, ameloblastoma expressed as a percentage of all oral and maxillo-facial tumors, Akinosi and Williams reported 25% (excluding cysts and other benign tumors), Dodge, 25% (excluding Burkitt's tumor) and Mosadomi, 9.5% (excluding cysts and fibrous epulides). The seemingly higher frequency of ameloblastoma in this environment as seen in this survey, therefore buttresses the suspicion of a higher prevalence of this tumour in Africa as has already been expressed by several authors, and which appears to have been statistically proven by Sawyer et al.

The higher frequency of ameloblastoma in this part of the world as stated here, appears to greatly influence the frequency of odontogenic tumors in general. Thus, while it has been reported to form only 18% of odontogenic tumors in America, Ameoloblastoma forms as much as 49.5% in this series and even higher in other reports from Africa.

The mean of 29.4 years for all cases studied appears slightly lower than the 38.9 years recorded by Small and Waldron in their large survey but is close to the mean of 31.2 years recorded by Akinosi and Williams, and that of 32 years recorded by Adekeye. By and large the tumor spares children. Sawyer et al. This is only true to an extent. The youngest patient in this study was 12 years. Fifteen of the forty-eight patients or 31.3% of the patients in this study were between 11 and 20 years. This is similar to the findings in two other reports. This study would therefore appear to endorse the relatively lower age of occurrence of this tumor in this part of the world when compared with the figures often quoted for the western world. It is particularly significant to note that in this part of the world patients have often waited longer, in some cases up to 15 years, before reporting for treatment. Bearing this in mind and giving the fact that this tumor is slow growing, ameloblastoma could be said to be relatively more frequent in the younger age group in this part of the world. The reason for the discrepancy is not clear, though, as earlier suggested by Adekeye, it is difficult to be certain of patients' ages in Nigeria as births are not routinely recorded in the rural parts of the country. Thirty or 62.5% of the patients were between the ages of 10 and 30 years, the peak incidence range. This again deviates a little from the range of 20-50 observed by Small and Waldron, but is similar to others observed in Africa.

The male to female ratio of 2:1 showing a male bias in this survey, is the same as in other studies. The predilection of ameloblastoma for the symphysis and premolar regions in Nigeria as opposed to the molar regions in Caucasians has been reported and described as being peculiar to Nigerians. In a recent report by Takahashi et al., 22% of ameloblastomas treated by them in Japan were patients less than 16 years old. In all these young patients the tumor was located either in the mandibular ramus or molar regions. In fact, none was located in the anterior region. By contrast, in this survey, of all tumors affecting the ages 20 years and below, 80% were located in the symphysis and premolar regions, 20% in the molar region and none in the ramus region. Similarly, the
The highest figure of 50% of all anteriorly placed tumors affected the age group 20 years and below, decreasing gradually with increasing age to 4.2% for the 61 years and above age group.

There thus appear in this study to be a linear relationship between anterior location of the tumor and the age of the patient. Striking, as this may appear to be, no obvious reason can immediately be adduced from it. However, it is thought here that this may be of etiological significance. Calculus deposits and oral sepsis in the anterior mandible have earlier been suggested, but these do not seem to explain the variation of the site of the tumor with the age of the patient since calculus deposits occur invariably in all age groups in this environment. Trauma resulting from dental extractions, falls, assaults and road traffic accidents was volunteered by 28 patients as having preceded the discovery of the tumor; but this was not unique to the younger age group or cases of anteriorly located tumors alone. Six of the cases were associated with a dental cyst. This association of the tumor with dental cysts has already been mentioned by several authors, but does not explain why the location of the tumor seems to vary with the age of the patient as seen in this study. The anterior predelection of the tumour in young patients remains unexplained.

Resorption of the apices of teeth involved in the tumor is a commonly seen radiographic feature in cases of ameloblastoma in Nigeria. This was found to be the case in this study. Another significant feature observed radiologically, and which Nwok is earlier pointed out, was that no matter the degree of involvement of the ascending rami, the condylar head was almost invariably spared.

In terms of treatment for this tumor, it is clear from this study that enucleation has no place at all. In all the 6 patients treated by this method the tumor recurred soon after. The compact bone of the lower border of the mandible may be eroded but is unlikely to be invaded, hence it is thought desirable on general clinical and surgical grounds to save this part of the bone, then as a calculated risk, the clinical and radiological margin of the lesion may be regarded as the true margin. This principle of selective conservative surgical treatment was successfully applied in the 11 cases treated by marginal resection. The application of this principle is good in cases where mandibular form needs to be preserved or where facilities or expertise for reconstruction are not readily available. For it to be successful, however, there is the need to ensure a good and regular follow-up in order to detect and deal with any recurrence early. The three cases that recurred were easily treated with minimal deformity and a denture fitted soon after, thus maintaining the patient's aesthetics and quality of life. The surface of the saved cortical bone was routinely planed well by drilling with a vulcanized bur and well washed with normal saline before wound closure. This form of treatment avoids the need for reconstruction, and is to be preferred wherever possible. Otherwise, a total resection of the tumor with at least 1cm of healthy tissue has been found to offer the best result. This method of treatment was used on 8 patients, with only 1 recurrence after a time lapse of 4 years.

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