A Review of Literature on Ameloblastoma in Children and Adolescents and a Rare Case Report of Ameloblastoma in a 3-Year-Old Child

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Abstract

A rare case report of a plexiform unicystic ameloblastoma in a 3-year-old girl stimulated us to conduct a review of literature to understand the correlation of this tumor with various factors such as that of age, sex, histopathological correlation, and its incidence rates pertaining to children and adolescent population. This is a case report of ameloblastoma in a 3-year-old patient, along with a literature review of ameloblastoma in relation to age. A computerized literature search using Medline was conducted for published articles on treatment of ameloblastoma. MeSH phrases used in search were ameloblastoma AND age; ameloblastoma AND children. The search was restricted to published articles from 1970 to 2010, as the histological features were not clearly defined until 1st edition of WHO histological classification of odontogenic tumors of 1971, search parameter was also set to select literatures under English language only. An additional systematic hand search was also conducted simultaneously to identify other published articles, considering similar parameters as used for Medline search. Most of search result yielded literatures in which primary importance were given to treatment patterns and prognosis of intervention, there were not much specific article or meta analysis which reviewed on the affected age range of ameloblastoma exclusively. We reviewed the identified literatures with patients' age, case numbers, incidence, sex, location, and histopathology. The statistical data collected were exported to SPSS 16.0 for windows software which performed a descriptive analysis giving an average mean age of 14.1 years (range from 4 to 20); with maximum mean age being 16.0 and minimum mean age being 10.8 with standard deviation of 1.60. Majority of lesions 91.86% (327 of 356) were found between the age group of 11 and 20 years, only 8.14% (29 of 356) were below the age of 10 years. This rare case report highlights occurrence of plexiform unicystic ameloblastoma in maxilla of a 3-year-old girl, which is very much incongruent with the various review of literature on ameloblastoma in children and adolescents. We have emphasized the significance of patient's age and histopathological pattern of the tumor as it has its influence on the treatment plan. However, there is much of research needed with focus in respect to age, histological pattern, and treatment outcomes.

Keywords
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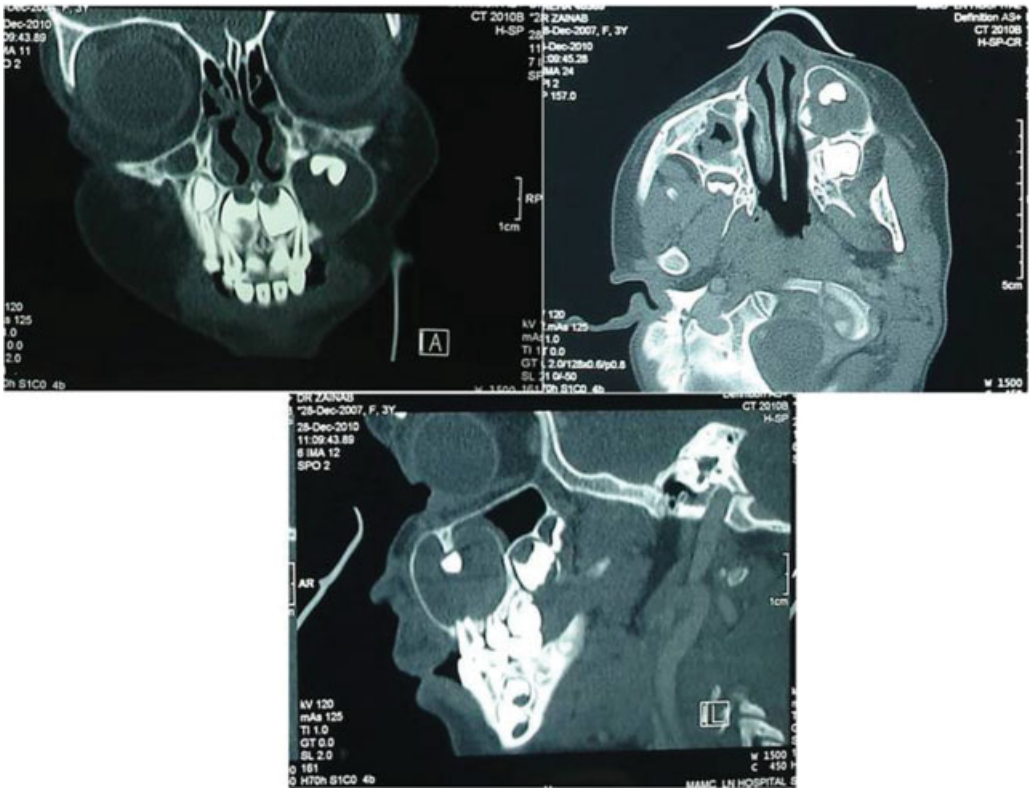

Figure 1 Coronal, axial, and sagittal slices showing the cystic nature of the lesion located at left maxilla.

Ameloblastoma is one of the most common odontogenic tumors of the maxillofacial region; it is a locally invasive neoplasm with maximum incidence reported in the 3rd and 4th decade of life and rarely in childhood.[1,2] Small and Waldron[3] had pointed out that the tumor has a slow growth rate, which generally starts to develop around early childhood and young adulthood.

Case Report

A 3-year-old girl was brought by her parents to our Oral and Maxillofacial Surgery outpatient department. The parents were concerned with appearance of a diffuse swelling over left side of child's face which gradually increased in size over the past 6 months. The swelling seem to be localized over the right nasolabial region obliterating the nasolabial fold. The mass had expanded the maxillary bone and was hard to palpation due to the continuity of bony cortex.

A fine needle aspiration was performed which yielded a clear, straw-colored fluid which on histological analysis showed pus cells, few red blood cells, and cholesterol crystals. An orthopantomogram was performed which revealed a radiolucent lesion with ill-defined borders and the lesion included partially calcified tooth bud of the left maxillary canine. The child was further subjected to a contrast enhanced computed tomography, to understand the extent of the lesion which also confirmed the cystic nature of the lesion, measuring ~1.8 cm anteroposteriorly, 1.6 cm superioinferiorly, and 2.7 cm mediolaterally at its maximum, and involved the region anteromedial to left maxillary sinus, cystic cavity was separated from left maxillary sinus by a thin bony septum. The lesion seemed to expand the maxillary labial cortex without any perforation and with no expansion of the lateral nasal wall. The lesion's posterior extent was not beyond the anterior border of vertical plate of palatine bone (►**Fig. 1**).

Considering nature of the lesion, location, and age group of the patient a provisional diagnosis of dentigerous cyst was arrived at; other differential diagnosis options included primordial cyst and radicular cyst which were the closest applicable. Due to young age of child and risk involved, an incision biopsy to confirm the nature of the lesion could not be performed under local anesthesia or sedation, hence the cyst was enucleated under general anesthesia. The entire cystic wall was excised along with the permanent tooth bud of left maxillary canine as it was within the content of cyst cavity. The cyst lining along with excised tooth bud were sent for routine histopathological evaluation, which was reported as a mural subtype unicystic ameloblastoma with plexiform changes (►**Fig. 2**). Considering the high potential of this pattern of unicystic ameloblastoma for its recurrence, the patient was taken up for surgery again after a period of 2 months in which a peripheral ostectomy and Conroy's solution application was performed; the resected bony tissue was free of any ameloblastic infiltrations, the patient has been kept on regular clinical follow-up for the past 4 months (►**Fig. 3**).

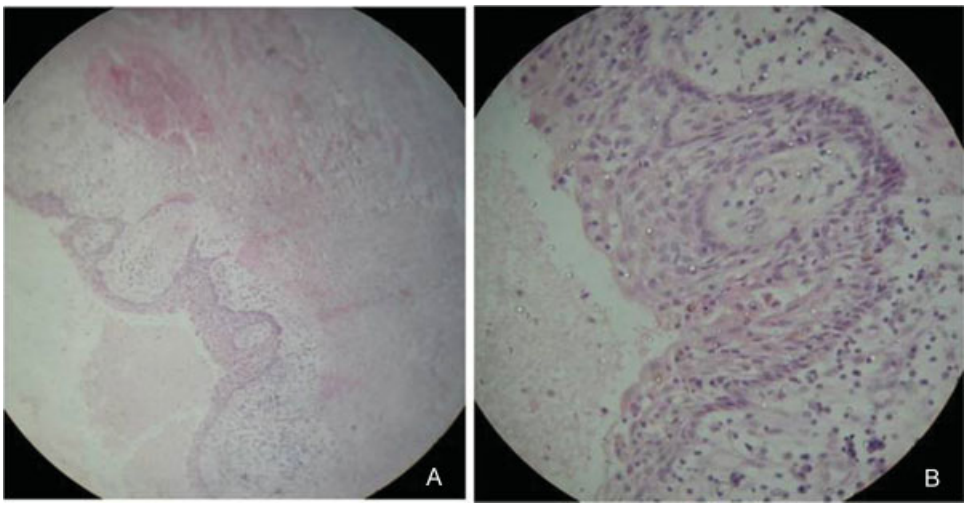

Figure 2 Low-power (10×) and high-power magnification (40×) showing histopathological sections of plexiform ameloblastoma with mural extension on the cyst lining.

Figure 3 (A) Preoperative view showing minimal swelling over left side of face, minimally obliterating nasolabial fold. (B) Postoperative view showing reduction in swelling 4 months postoperative. (C) Postoperative at 4 months, Water's view showing bony formation in the region of left maxillary sinus region.

Materials and Methods

A computerized literature search using Medline was conducted for published articles on ameloblastoma with emphasis on its presentation at various age groups. MeSH phrases used in the search were: ameloblastoma AND age; ameloblastoma AND children. The Boolean operator "AND" was used to combine and narrow the searches. The full texts of all these articles were thoroughly examined by the authors.

Most articles were case reports, gene expression studies, retrospective case series, and nonrandomized controlled studies. Results also contained various other literatures including pattern of other odontogenic lesions, tumors of long bones, and case reports of ameloblastoma in extra maxillofacial sites. The search was set to find the keywords in the title, abstract, and text, results that appeared were of age range and mean age of patients with the affliction.

Most search results yielded literatures in which primary importance was given to site distribution, treatment patterns, and prognosis of intervention. There was no such specific article or meta-analysis which reviewed on the affected age range of ameloblastoma exclusively. Search results were further refined by restricting search to literature published between 1970 and 2010 in English language. An additional hand search was also made to identify other published articles taking same parameters for online search. There were two inclusion criteria: (1) the study must be consistent with WHO histological classification of odontological tumors of 1971 and (2) those studies were included in which the author has mentioned or categorized the various age groups affected. Exclusion criteria were applied to (1) literature reviews comprising oral and maxillofacial tumors and (2) literatures on ameloblastoma in which age details were not properly described.

Results

Ameloblastoma in children and adolescents while conducted in a Medline search, did not yield many results which were specific to the pediatric or adolescent age group. The search results, however, yielded routine reviews of ameloblastoma which had mentioned or categorized according to age of the patients affected with the lesion. These were also incorporated as they would also contribute to the case numbers and incidence rate. Additional hand searches were also performed which yielded more articles specific to pediatric population than Medline search, they were also included in study (►**Table 1**).

Not all articles had complete information about various parameters such as sex, site, or mean age affected. A total of 372 patients (372/2199, 16.9%) were encountered below the age of 20 years. From the mentioned articles about the sex distribution there were 130 males (130 of 240) and 110 females (110 of 240) with a male–female ratio of 1.18:1. The statistical data collected were exported to SPSS 16.0 for windows software, which performed a descriptive analysis giving an average mean age of 14.1 years (range from 4 to 20); with maximum mean age being 16.0[4] and minimum mean age being 10.8[5] with a standard deviation of 1.60.

Majority of lesions 91.86% (327 of 356) was found between the age group of 11 and 20 years; only 8.14% (29 of 356) were below the age of 10 years. Mandible (96.6%, 232 of 240) was 29 times more affected than maxilla (3.3%, 8 of 240).

Certain studies had correlated the age of the patient with the histological pattern. Ord et al[6] encountered 81% of his cases having unicystic type, Takahashi et al[7] reported 66% of their cases with plexiform type, Al-Khateeb and Ababneh[4] also reported 60% of their cases having unicystic variant, Zhang et al[8] reported 48.7% of their cases having follicular histological pattern.

Discussion

Age and Population

The age of presentation varies with changing locations according to various literature reviews, but age range usually remains within standard accepted age group of 2nd to 7th decade; however, there are minor differences within various racial groups and ethnicities.

The youngest case of ameloblastoma reported was at the age of 2 years,[9] but there were no specific details of its clinicopathological nature mentioned in the review. The oldest case reported with ameloblastic lesion was at the age of 93 years[6]; however, it is unclear whether the case was an initial or a recurrent presentation. The highest mean age was 16.0 of a Jordanian review[4] and the lowest mean age was of 10.8 of Argentinean review.[5]

In regions where there were mixed ethnicities comprising African, Caucasians, Asians, and others, Ord et al[6] and Kahn[10] reported about similar rates for affected pediatric cases of African-American origin (45.5 and 42.4%), along with their Caucasian report rates (54.5 and 57.6%) with the absence of mention to other races.

The overall incidence rate of ameloblastoma in age group of less than 20 years has come to 16.9%; this is comparatively more than similar such recent reviews on pediatric and adolescent population by Zhang et al,[8] who gave an overall incidence rate of 15.9% in their literature review. The higher incidence rate in our review could be because of inclusion of routine literatures, which had mentioned the various pediatric age groups. Various other authors had contrasting reports with low prevalence (6.8 and 8.7%, respectively) by Keszler et al[5] and Huang et al,[11] whereas Al-Khateeb and Ababneh[4] and Ord et al[6] reported high rates (28.9 and 38.5%, respectively). A higher pediatric and adolescent incidence may be revealed, if all the future ameloblastoma reviews segregated their cases into various age groups standardizing the upper age limit, perhaps a true incidence rate could be obtained in respect to pediatric population.

Age and Histopathological Correlation

Not many articles correlated histopathology and the age affected. Among the adult population reviews, Adebiyi et al[12] demonstrated association of various histopathological types of the lesion to certain age groups, such as follicular and plexiform types were reported more frequently in the 3rd decade, desmoplastic and unicystic ameloblastoma occurring

Table 1 Reported Series Cases of Ameloblastomas in Children and Adolescents

Literature Data	Daramola et al[18]	Keszler et al[5]	Khan et al[10]	Chidzonga et al[19]	Takahasi et al[7]	Ord et al[6]
Published year	1975	1986	1989	1996	1998	2002
Case Numbers	16	8	38	20	6	11
Incidence	**16/70**	**8/92**	38/311	20/117	6/27	11/38
Age						
Range	5–17	4–15	7–19	11–18	8–15	12–20
<10	3	3	1	0	1	0
10–20	13	5	37	20	5	11
Mean	13.4	10.8	14.8	15.5	12.3	15.5
Sex						
Male	10	4	18	10	3	4
Female	6	4	20	10	3	7
M/F ratio	1.7:1	1:1	1:1.1	1:1	1:1	0.56:1
Site						
Maxilla	1	0	0	1	0	1
Mandible	15	8	38	19	6	10
Center/Country	Ibadeb, Nigeria	B A*, Argentina	TN*, USA	Harare, Zimbabwe	Chiba, Japan	BL*, USA
Histology & Age						
Follicular	–	–	–	–	–	–
Plexiform	–	–	–	–	66%	–
Desmoplastic	–	–	–	–	–	–
Achanthomatous	–	–	–	–	–	–
Unicystic	–	–	–	–	–	81%

Literature Data	Al Khateeb et al[4]	Arotiba et al[21]	Adebiyi et al[12]	Huang et al[11]	Adeline et al[20]
Published year	2003	2005	2006	2007	2008
Case Numbers	10	79	14	15	40
Incidence	10/26	79/360	14/77	15/223	40/184
Age					
Range	9–20	6–19	11–20	9–17	10–19
<10	1	9	0	1	0
10–20	9	70	14	14	40
Mean	16	14.7	NS	13.7	NS
Sex					
Male	4	45	NS	9	NS
Female	6	34	NS	6	NS
M/F ratio	1:1.5	1.3:1	NS	1.5:1	NS
Site					
Maxilla	0	4	NS	1	NS
Mandible	10	75	NS	14	NS
Center/Country	Irbid, Jordan	Lagos, Nigeria	Ife Ife, Nigeria	Kaohsiung, Taiwan	Nairobi, Kenya
Histology & Age					
Follicular	–	–	–	–	–
Plexiform	–	–	–	–	–
Desmoplastic	–	–	–	–	–

(*Continued*)

Table 1 (*Continued*)

Literature Data	Al Khateeb et al[4]	Arotiba et al[21]	Adebiyi et al[12]	Huang et al[11]	Adeline et al[20]
Achanthomatous	–	–	–	–	–
Unicystic	60%	–	–	–	–

Literature Data	Gunawardana et al[13]	Fregnani et al[22]	Zhang et al[8]	Total
Published year	2010	2010	2010	
Case Numbers	62	16	37	372
Incidence	62/286	16/121	37/267	372/2199
Age				
Range	5–19	2–18	5–18	
<10	7	NS	3	29/356
10–20	55	NS	34	327/356
Mean	NS	NS	14.4	
Sex				
Male	NS	NS	23	130/240
Female	NS	NS	14	110/240
M/F ratio	NS	NS	1.6:1	1.18:1
Site				
Maxilla	NS	NS	0	8/240
Mandible	NS	NS	37	232/240
Center/Country	Peradeniya, SriLanka	Sao Paulo, Brazil	Xi'an, China	
Histology & Age				
Follicular	–	–	48.7%	
Plexiform	–	–	–	
Desmoplastic	–	–	–	
Achanthomatous	–	–	–	
Unicystic	–	–	24.3%	

*BA, Buenos Aires; TN, Tennessee; BL, Baltimore.

in the 4th decade, and acanthomatous type occurring in the 7th decade of life; however, he did not statistically correlate their findings.

Darshani Gunawardhana et al[13] too presented a similar pattern of histopathological correlation with the follicular and plexiform types having a peak incidence of presentation in the 3rd decade, desmoplastic in 3rd to 5th decade, acanthomatous type in the 4th to 5th decade, and unicystic ameloblastoma was, however, reported most commonly in the 2nd decade of life. Fulco et al[9] had grossly classified ameloblastoma into three histological types of solid, desmoplastic, and hybrid according to the WHO 2005 classification, in which solid ameloblastoma comprised the histological subtypes of follicular, plexiform, and acanthomatous; affected age groups between 12 and 92 years, desmoplastic affecting population between 20 and 51 years, and the hybrid variant affecting age group between 44 and 71 years (►**Table 2**).

In the exclusive pediatric and adolescent review there were only rare examples of correlation or emphasis of age and the histopathology of such lesions. Takahashi et al[7] reported 66% of the cases with plexiform type, Al-Khateeb and Ababneh[4] and Ord et al[6] reported a high percentage of their tumors to be unicystic in nature (81 and 60%); contrastingly Zhang et al[8] reported a low percentage (24.3%) of their cases with unicystic type, where the predominant histopathological pattern was of follicular type (48.7%) (►**Table 1**).

Most of the articles paid more emphasis on the radiographic characteristics rather than the histopathology of the lesion, as histopathological pattern has an equal to more weightage on the treatment plan than radiographic appearance. Radiographic pattern helps determining a provisional diagnosis of the lesion and in guidance during surgery for providing tumor-free margins; it does not play a major role in the prognosis or the recurrence pattern.

Hong et al[14] correlated in their report of 305 ameloblastomas, that there was a strong recurrence pattern for follicular, granular, and acanthomatous types of ameloblastoma and a low recurrence potential for other patterns including desmoplastic, peripheral, plexiform, and unicystic.

However, there has been a correlation drawn between radiological pattern and histological type of ameloblastoma,[2]

Table 2 Age Range and Histopathological Correlation in Adult and Adolescent Population

Histological Pattern	Age Range (Years)	Country
Follicular	21–30	Ife Ife, Nigeria[12]
	21–30	Peradeniya, Sri Lanka[13]
	12–92	Rio Grande, Brazil[9]
Plexiform	21–30	Ife Ife, Nigeria[12]
	21–30	Peradeniya, Sri Lanka[13]
	12–92	Rio Grande, Brazil[9]
Desmoplastic	31–40	Ife Ife, Nigeria[12]
	21–50	Peradeniya, Sri Lanka[13]
	20–51	Rio Grande, Brazil[9]
Acanthomatous	61–70	Ife Ife, Nigeria[12]
	31–50	Peradeniya, Sri Lanka[13]
Unicystic	31–40	Ife Ife, Nigeria[12]
	11–20	Peradeniya, Sri Lanka[13]

but that should not preclude a surgeon from incorporating the histopathology into the treatment plan.

Age and Treatment

There is, however, a general consensus in various literatures that ameloblastoma has to be treated aggressively to avoid recurrences,[15,16] but there is a dilemma on the applicability of an initial radical, extensive surgery procedures treatment in children.[17] In the pediatric age groups, patient's age, tumor size, location, histology, and the growth factor have to be considered. If a radical approach has to be used, then a simultaneous reconstruction has to be performed keeping in mind the deformity and dysfunction it would cause if avoided. The treatment regimen for ameloblastoma can be divided into three modalities: conservative (enucleation and curettage), marsupialization, and radical surgery (resection with or without continuity defect). In case of solid/multicystic ameloblastoma the treatment choice is in general resection with a 1.5- to 2.0-cm margin beyond the radiological limit.[23] In case of the unicystic ameloblastoma some authors recommend a treatment modality of marsupialization followed by enucleation.[24,25] Unicystic ameloblastoma has been considered to be lesion with a comparatively less recurrent potential than the solid type,[26] but the various subtypes of unicystic ameloblastoma have different prognostic features, the intraluminal subtype seem to be less aggressive compared with the intramural or mural subtype.[27] A systematic review conducted by Lau and Samman[28] has voluminously described about the recurrence pattern of unicystic ameloblastoma, in which they classified the treatment modalities into four patterns: resection, enucleation, enucleation with Conroy's solution application and marsupialization. The modality of enucleation alone had the highest recurrence rate of 30.5% and the minimum recurrence rate being that of resection with 3.6%. They further discussed that resection in case of an unicystic ameloblastoma may be an overtreatment and hence an option of enucleation along with Conroy's solution application should be given more weightage in treatment options.

Conclusion

This rare case report highlights the occurrence of plexiform unicystic ameloblastoma in maxilla of a 3-year-old girl, which is very much incongruent with the various review of literature on ameloblastoma in children and adolescents. We have emphasized the significance of patient's age and histopathological pattern of the tumor as it has its influence on the treatment plan. However, there is much of research needed with focus in respect to age, histological pattern, and treatment outcomes.

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