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ORIGINAL ARTICLE

A clinicopathologic study of 173 odontogenic tumours in Northern Peninsular Malaysia (2007-2014)

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Abstract

Introduction: The objectives of this study were to analyse, compare and contrast the demographic, clinical and pathological data of odontogenic tumours seen at a regional oral pathology centre in the Northern part of Peninsular Malaysia with other international data as an aid to clinicians in diagnosing odontogenic tumours. *Materials and Methods:* This was a descriptive, retrospective study of odontogenic tumours diagnosed from January 2007 to December 2014 at this centre. The odontogenic tumours were classified using the 2005 World Health Organization classification system. *Results:* Among 2,733 biopsy specimens, 173 cases were diagnosed as odontogenic tumours (6.3%), of which 171 (98.8%) are benign and 2 (1.2%) are malignant. The most frequently encountered tumour was ameloblastoma (n=96, 55.5%), followed by keratocystic odontogenic tumour (KCOT) (n=38, 22.0%) and odontomas (n=16, 9.2%). Malignant tumours accounted for 1.2% of the tumours. Most ameloblastomas and KCOTs affected the mandible preferentially. The mean age was 33.5 (± 17.8) years and 64.7% of patients were in the age group of 10 to 39. Odontogenic tumours were slightly more common in males, with a male to female ratio of 1.4:1. *Conclusion:* The findings of this study are similar to the other studies in Asia in which the most common tumour encountered is the ameloblastoma, followed by KCOT. The most common signs and symptoms are pain and swelling, while paraesthesia and root resorption are less frequently reported. Such clinical and radiographic features should alert the clinician of a possible odontogenic tumour and though rare, malignant tumours should also be included in the differential diagnoses.

Keywords: Odontogenic tumour, oral pathology, ameloblastoma

INTRODUCTION

Odontogenic tumours (OTs) are rare, comprising only about 1–9% of all tumours in the jaws.[1-2] They derived from the epithelial, ectomesenchymal or both elements of the tooth forming apparatus which have a potential to differentiate into either tooth or periodontal structures. Thus their histological appearance may recapitulate odontogenesis at any stage of the tooth development. Another distinctive feature of these tumours is that the extracellular substances may calcify due to epithelial–mesenchymal interactions. Therefore, OTs may appear radiolucent, radiopaque or mixed radiopacity on radiographs depending on the types of tumour and extent of calcification. These tumours commonly appear as benign neoplasms but rarely, may also present as aggressive malignant tumours. Most of the tumours are found exclusively in the mandible, maxilla and rarely, extraosseously. The common clinical presentations include swelling of the jaws and pain. Paraesthesia and root resorption of adjacent teeth are less common findings.

To date, there are few studies on the socio-demographic profile, clinical and histopathologic features of oral and maxillofacial lesions within Malaysia.[3-5] This is a pilot study to address the lack of local data concerning patients with odontogenic tumours. Therefore, this present study is conducted to analyse the demographic, clinical and pathological data of OTs retrospectively in Northern Peninsular Malaysia based on the World Health Organization (WHO) classification 2005 to aid clinicians in formulating a diagnosis and to

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compare the results with other published data. In the new WHO classification of odontogenic tumours (2017),[6] one of the changes is the keratocystic odontogenic tumour (KCOT) has been reclassified into the odontogenic cyst category as odontogenic keratocyst (OKC). In our study, KCOT was classified as an odontogenic tumour as at the time of diagnosis the WHO classification 2017 has not yet been published.

MATERIALS AND METHODS

This is a descriptive, retrospective study. The subjects in this study were cases of OTs that were biopsied by oral maxillofacial surgeons at various hospitals at the Northern Region of Peninsular Malaysia (Perlis, Kedah and Penang) and were sent for histopathologic examination by an Oral Pathology and Oral Medicine Specialist (Dr. Sumairi Ismail), Sultan Abdul Halim Hospital, Kedah. Oral histopathology reports and patient clinical information (including radiographic findings) where available, were reviewed from January 2007 until December 2014. Data was analysed according to age, gender, ethnic group, tumour site, signs & symptoms and histopathologic typing. Those cases lacking information on one of the above were excluded. Age was recorded as at the time of diagnosis. Histopathologic typing was classified according to (WHO) classification (2005)[7] which was in use at the time of diagnosis.

The determination of site of maxillary and mandibular tumours was based on the clinical tumour extension (clinical and radiographic findings) as used by Sriram and Shetty (2008).[8] The lesions of the maxilla were divided into 3 categories. Class 1 consisted of lesions in the anterior segment of the maxilla (from the distal aspect of 13 (upper right canine) to the distal aspect of 23 (upper left canine). Class 2 consisted of lesions in the posterior segment of the maxilla (from mesial aspect of the first premolar to the end of the dental arch). Class 3 consisted of lesions that involved all segments of the maxilla.

The lesions of the mandible were divided into 4 categories. Class 1 consisted of lesions in the anterior segment of the mandible (from the distal aspect of 33 (lower left canine) to the distal aspect of 43 (lower right canine)). Class 2 consisted of lesions in the posterior segment of the mandible (from the mesial aspect of first premolar to the end of the dental arch). Class 3 consisted of lesions that involved the ramus and angle of the mandible (from distal aspect of second molar to the condyle). Class 4 consisted of lesions that involved all segments of the mandible.

The relevant data was obtained from patient records and data was recorded into a standardised proforma (Data Collection Sheet). This study was registered with the National Medical Research Registry (NMRR) and was granted ethical approval from Medical Research & Ethics Committee, Ministry of Health Malaysia (NMRR Number: NMRR-14-1891-19022 (IIR)).

RESULTS

Among 2,733 oral biopsy specimens received, only 173 cases were diagnosed as OTs (6.3%). There were 171 (98.8%) benign and 2 (1.2%) malignant tumours. Centrally located (intraosseous) tumours accounted for 171 cases; whereas, only 2 cases were peripheral (extraosseous). The two peripheral OTs seen were peripheral ameloblastoma. The commonest tumour was ameloblastoma (n=96, 55.5%), which occurred mainly in the mandible. Keratocystic odontogenic tumour (n=38, 22.0%) was the second most common tumour followed by odontomas (n=16, 9.2%).

The ages of the patients varied widely (range 9–78 years) with a mean age of 33.5 (± 17.78) years (Table 1). The tumours arose mainly in young people between the ages of 10 to 39 (n = 112, 64.7%). Odontogenic tumours were slightly more common in male (n=100, 57.8%) than female (n=73, 42.2%), with a male to female ratio of 1.4:1. Odontogenic tumours are more common in Malay ethnic group (65.3%) followed by Chinese (20.8%) and Indian (10.4%). The remainder of the cohort were made up of other ethnic groups.

The most common signs and symptoms were swelling (n=171, 98.8%), pain (n=50, 28.9%) and paraesthesia (n=19, 11.0%). All OTs showed signs of swelling except one case of multicystic ameloblastoma and one case of compound odontoma. Symptom of pain was reported in ameloblastoma (n=23), KCOT (n=15), calcifying cystic odontogenic tumour (n=4), complex odontoma (n=4), primary intraosseous squamous cell carcinoma (n=1) and clear cell odontogenic carcinoma (n=1). Paraesthesia was evident in ameloblastoma (n=11), KCOT (n=4), primary intraosseous squamous cell carcinoma (n=1), clear cell odontogenic carcinoma (n=1), calcifying cystic odontogenic tumour (n=1) and adenomatoid odontogenic tumour (n=1). Root resorption of adjacent teeth was observed

TABLE 1: Age distribution of odontogenic tumours by decades

Histological Types	Age Groups (years)										Total	
	Age Range	Mean Age	0-9	10-19	20-29	30-39	40-49	50-59	60-69	>70	n	%
Benign tumours												
Ameloblastoma:												
Solid/multicystic	9-78	35	1	20	20	9	11	17	4	3	85	49.1
Unicystic	11-48	22	-	5	1	1	1	-	-	-	8	4.6
Peripheral	57-58	58	-	-	-	-	-	2	-	-	2	1.2
Desmoplastic	43	43	-	-	-	-	1	-	-	-	1	0.6
KCOT	11-73	31	-	10	8	12	2	5	-	1	38	22.0
Odontoma	10-65	23	-	9	4	-	2	-	1	-	16	9.2
CCOT	14-71	40	-	4	2	-	1	2	2	1	12	6.9
AOT	14-60	26	-	1	6	-	-	-	1	-	8	4.6
Odontogenic myxoma	53	53	-	-	-	-	-	1	-	-	1	0.6
Malignant tumours												
CCOC	53	53	-	-	-	-	-	1	-	-	1	0.6
PIOSCC	56	56	-	-	-	-	-	1	-	-	1	0.6
TOTAL			1	49	41	22	18	29	8	5	**173**	**100.0**

KCOT: Keratocystic odontogenic tumour; CCOT: Calcifying cystic odontogenic tumour; AOT: Adenomatoid odontogenic tumour; CCOC: Clear cell odontogenic carcinoma; PIOSCC: Primary intraosseous squamous cell carcinoma

in ameloblastoma (n=7), primary intraosseous squamous cell carcinoma (n=1) and clear cell odontogenic carcinoma (n=1).

Table 2 shows site distribution of each type of OTs. The mandible (n=134, 77.5%) was more commonly involved than the maxilla (n=39, 22.5%) for all tumours, with a ratio of 3.4:1, and this was particularly prominent for ameloblastomas (Mandible:Maxilla ratio 6.4:1). Majority of ameloblastoma involved the posterior segment of mandible (n=52, 54.2%) and ramus and angle of mandible (n=29, 30.2%). Two cases of ameloblastoma showed involvement of all segments of mandible. A slight mandibular predominance was evident in KCOT with a Mandible:Maxilla ratio of 1.9:1. Also, KCOT was mostly seen at the posterior segments of the mandible (n=14, 36.8.1%) and posterior segments of the maxilla (n=12, 31.6%).

Only two cases of malignant odontogenic tumours were reported which are clear cell odontogenic carcinoma and primary intraosseous carcinoma.

DISCUSSION

In the present study, odontogenic tumours form a relatively small proportion of oral and maxillofacial lesions comprising only 6.3% of all specimens received within this period. This figure is relatively similar to the studies reported in the Indian population and Brazilian population, 5.78% and 4.79% respectively.[9,10] A higher incidence was reported in the African population, 9.6% and 8.6%.[2,11] Findings from South American (1.29%), North American (2.5%), and European studies (0.74%) however, suggest that OTs are less frequently seen.[1,12,13]

In this study, ameloblastoma was the most common odontogenic tumour, accounting for 55.5% of all OTs, which is higher compared to reports by Varkhede *et al*. (40.8%), Sekerci *et al*. (30.2%), da Costa *et al*. (29.8%) and Saghravanian *et al*. (42.4%).[9,14,15,16] The second most frequent tumour is KCOT (22%), followed by odontomas (9.2%). Several other studies in Asia also reported a similar order of frequency of OTs in occurrence (Table 3).[9,17,18] However,

TABLE 2: Site distribution of benign and malignant odontogenic tumours

Histological Types	Anatomic Site								
	Maxilla				Mandible				
	Total	C1	C2	C3	Total	C1	C2	C3	C4
BENIGN TUMOURS									
Odontogenic epithelium with mature fibrous stroma, without odontogenic ectomesenchyme									
Ameloblastoma:									
Solid/multicystic	5	2	3	-	80	8	41	29	2
Unicystic	-	-	-	-	8	-	8	-	-
Peripheral	-	-	-	-	2	-	2	-	-
Desmoplastic	-	-	-	-	1	-	1	-	-
Keratocystic odontogenic tumour	13	1	12	-	25	4	14	7	-
Adenomatoid odontogenic tumour	3	-	3	-	5	1	4	-	-
Odontogenic epithelium with odontogenic ectomesenchyme, with or without hard tissue formation									
Odontoma	12	9	3	-	4	1	3	-	-
Calcifying cystic odontogenic tumour	5	-	5	-	7	2	5	-	-
Mesenchyme and/or odontogenic ectomesenchyme, with or without odontogenic epithelium									
Odontogenic myxoma	1	1	-	-	-	-	-	-	-
Malignant tumours									
Clear cell odontogenic carcinoma	-	-	-	-	1	-	1	-	-
Primary intraosseous squamous cell carcinoma	-	-	-	-	1	1	-	-	-
TOTAL	39	13	26	-	134	17	79	36	2

in the African continent, odontogenic myxoma is reported to be the second most common OTs after ameloblastoma.[19,20] In contrast, studies from Chile, Mexico and Canada revealed that odontoma was the most common OT accounting for 45, 35 and 46%, respectively. Ameloblastoma was the second most common odontogenic tumour seen in these countries, accounting for 20, 24, and 18%, respectively (Table 3).[1,12,21]

In comparison to these studies, odontoma is the third most common OT encountered in the present study and appeared in a much lower frequency of 9.2%. This apparent difference could be attributed to the ethnic and geographic variation. Nevertheless, the incidence of odontoma in some populations could have been under-reported. Odontomas usually rarely exhibit any clinical symptoms and are discovered incidentally during clinical or radiographic examination. In many cases, removal of odontomas is carried out as a minor surgical procedure and the tissue was not sent for histopathological examination. Thus, the incidence of odontomas could be under-represented by our study.

According to this study, ages of the patients ranged from 9 to 78 years with a mean age of 33.5. Majority of OTs occur within the second to fourth decades of life. A slight male predominance was seen in this study with a male to female ratio of 1.4:1. This is consistent with previous studies by da-Costa *et al*. (1.33:1), Adebayo *et al*. (1.35:1), and Osterne *et al*. (1.24:1).[15,20,22] Majority of OTs was seen in the Malay ethnic

TABLE 3: Comparison of the present study with previous studies of different countries

Authors (Year)	Country	Number of cases	Two most common OTs (%)	Male/female ratio	Maxilla:Mandible ratio
Mosqueda-Taylor *et al*. (1997)[12]	Mexico	349	Odontoma (35) AMB (24)	1:1.25	1:1.03
Adebayo *et al*. (2001)[20]	Nigeria	318	AMB (73) OM (12%)	1.35:1	1:4.41
Ochsenius *et al*. (2002)[1]	Chile	362	Odontoma (45) AMB (20)	1:1.15	1:1.14
Ladeinde *et al*. (2005)[2]	Nigeria	319	AMB (63) AOT (7.5)	1:1	1:4.1
Olgac *et al*. (2006)[13]	Turkey	527	AMB (25) Odontoma (21)	1:1.12	1:1.9
Jing *et al*. (2007)[17]	China	1642	AMB (40.3) KCOT (35.8)	1.4:1	1:4.0
Saghravanian *et al*. (2010)[16]	Iran	165	AMB (42.4) Odontoma (26.7)	1:1.12	1:2.43
Tawfik and Zyada (2010)[18]	Egypt	82	AMB (41.5) KCOT (19.5)	1.2:1	1:5.0
Varkhede *et al*. (2011)[9]	India	120	AMB (40.8) KCOT (37.5)	1.4:1	1:2.75
da Costa *et al*. (2012)[15]	Brazil	201	KCOT (32.3) AMB (29.8)	1.33:1	1:2.69
Sekerci *et al*. (2015)[14]	Turkey	218	AMB (30.2) KCOT (19.5)	1.01:1	1:3.5
da Silva *et al*. (2016)[10]	Brazil	289	KCOT (34.6) AMB (32.9)	1:1.3	1:2.5
Present study	Malaysia	173	AMB (55.5) KCOT (22.0)	1.4:1	1:3.4

AMB: Ameloblastoma; OM: Odontogenic myxoma; AOT: Adenomatoid odontogenic tumour; KCOT: Keratocystic odontogenic tumour

group (65.3%), followed by Chinese (20.8%) and Indians (10.4%). However, these differences are merely a reflection of the ethnic distribution in Malaysia.

The most common signs and symptoms reported in this study were swelling (n=171, 98.8%), pain (n=50, 28.9%) and paraesthesia (n=19, 11.0%), among all types of OTs. The symptom of pain was most reported in ameloblastoma (n=23) and KCOT (n=15). Similarly paraesthesia was evident in ameloblastoma (n=11) and to a lesser extent in KCOT (n=4), but comparatively less common compared to swelling and pain. Similar findings were reported in previous studies.[16,23,24,25,26]

Odontogenic tumours showed a significant predilection for the mandible, with a maxilla:mandible ratio of 1:3.4 which is consistent with previous reports.[8,14,17,27] In our series, ameloblastomas tend to involve the posterior mandible (54.1%), angle and ramus of the mandible (30.1%). This mandibular preponderance concurs with several other reports.[4,25,26,28] Keratocystic odontogenic tumours also have a similar predilection, with an occurrence of 55.3% at the posterior mandible and 30.2% at the angle and ramus of mandible.

Malignant OTs are very rare. There were only two (1.2%) in this series. Studies by Osterne *et al*. (1.62%), Mamabolo *et al*. (1.6%) and Siriwardena *et al*. (1.29%) also reported similar incidences.[22,29,30] However, the frequency was found to be significantly higher in Turkish (5.5%), Brazilian (5.5%) and Chinese (5.9%) populations.[14,15,27] In addition to swelling, pain and paraesthesia, root resorption of adjacent teeth was reported in both cases of malignant odontogenic tumours. These are common findings observed in malignant OTs considering their very aggressive behavior.[31,32,33,34]

Limitations of this study include lack of full clinical and radiographic information for all patients, such as clinical presentation, initial diagnosis and its differentials, treatment and outcomes as this study is limited to an analysis of histopathology data. Further research in the areas of management, outcome and prognosis of patients with OTs is recommended in the future.

CONCLUSION

Over the 7 year period of this retrospective study in Northern Peninsular Malaysia, odontogenic tumours constituted only 6.3% of all oral biopsy specimens. Among these, ameloblastoma was the most common (55.5%), followed by keratocystic odontogenic tumour (22%) and odontoma (9.2%) based on the WHO classification 2005. However, according to the new 2017 classification, the second most common tumour would be odontoma, after ameloblastoma as KCOT is now re-categorised as a cyst. Malignant tumours only accounted for 1.2% of the tumours. The majority of ameloblastomas and KCOTs involved the posterior segments of the mandible. Odontogenic tumours commonly affected young patients ranging from the age group of 10 to 39 with a slightly higher male predilection. The most common signs and symptoms were pain and swelling, while paraesthesia and root resorption were less frequent.

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