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Clinicopathological study of dentigerous cysts in Singapore and Malaysia

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Abstract

This was a retrospective study of dentigerous cysts in people from the Singapore-Malaysian region. The purpose of this study was to present the clinicopathologic features of dentigerous cysts in the Oriental population and to compare these data with those from other reported studies. Biopsy records from 1981 to 1993 of 119 cases of dentigerous cysts from patients in Malaysia and Singapore showed that 36.1% of patients were female and 63.9% patients were male. Among patients with cysts, 70.5% were Chinese, 23.2% were Malays, 2.7% were Indian and 3.6% were other ethnic groups. The mean age of these patients was 30.2 $\pm$ 17.3 years with a peak incidence occurring in the second and third decades. The location of the lesions was almost equal to the maxilla (50.9%) and the mandible (49.1%). There was a marked predilection for the posterior mandible (42.7%) followed by the anterior maxilla (38.2%). Histologically, 90.8 % of the cysts were lined by a non-keratinised stratified squamous epithelium. The cyst linings were mainly thin (90.0%) with 38.7% of cases having a mixed thick and thin lining. Mucous metaplasia was observed in 9 (7.6%) cases. Rushton bodies were seen in 3.4% of cases. Cholesterol clefts in the epithelial lining and lumen were found in 16.8% cases while 12.6% of cases exhibited cholesterol clefts in the cyst wall. Other cellular structures within the cyst wall were lymphocytes (66.4%), plasma cells (52.1%), Russell bodies (16.0%) and histiocytes (4.2%). Odontogenic keratocysts were observed in 5.0% of cases. One case of adenomatoid odontogenic tumour was also observed. Epithelial atypia was seen in 9.2% of cases, islands of stratified squamous epithelial cells in 8.4% of cases while one case showed a combination of these two features. In conclusion, some clinical features seen in this study are similar to that for the Caucasian population such as prevalence in male, peak incidence in the second and third decades and the predilection for the posterior mandible and anterior maxilla. Histopathologically, odontogenic keratocyst and adenomatoid odontogenic tumour were observed in dentigerous cysts.

Key words: dentigerous cyst; odontogenic keratocyst; adenomatoid odontogenic tumour; histology, orientals

INTRODUCTION

Odontogenic cysts commonly encountered in dental practice are the radicular cysts and dentigerous cysts. While the radicular cysts usually forms in response to pulpal death and subsequent tissue necrosis, the dentigerous cyst develops around the crown of unerupted teeth apparently in the absence of an inflammatory stimulus.[1,2]

It develops in two ways; by accumulation of fluid between the reduced enamel epithelium and the crown, or between the layers of the reduced enamel epithelium.[3] Al-Talabani and Smith[4] suggested that the former is associated with occurrence of enamel hypoplasia whereas for the latter variety, enamel hypoplasia is not a significant feature.

A number of good articles have been written about the clinicopathological features of dentigerous cysts.[2,5-12] However, the data for these studies were obtained from a predominantly Caucasian and South African population. Thus the purpose of this paper is to present the clinicopathological features of dentigerous cysts in the Oriental population, specifically from the multiethnic populations in Singapore and Malaysia; and to compare this data with the data from other reported studies.

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MATERIALS AND METHODS

The materials for this study were obtained from specimens submitted to the Histopathology Laboratory, Faculty of Dentistry, National University of Singapore (1982-1992) and the Oral Pathology Laboratory, Dental Faculty, University of Malaya (1981-1993). There were altogether 119 specimens, 52 from Malaysia and 67 from Singapore. To be included in the study, clinical criteria were applied in order for the specimen to be designated as a dentigerous cyst. The specific clinical criteria for this type of lesion was that it has to be a cyst that encloses the crown of an unerupted tooth and is attached to the neck, with a radiolucent area around the crown upon radiographic examination.[3] This specific clinical criteria form the basis of diagnosis. As this is a retrospective clinicopathological study, the authors rely solely on the description/ information provided in the biopsy form along with the specimens sent. As such, no effort was made to obtain radiologic picture.

Data on the subjects provided with the specimens, such as age, sex, ethnic group, radiographic description and lesion location were obtained from the information on the biopsy forms submitted to the laboratories.

Haematoxylin and eosin staining was performed. The stained sections were evaluated for the type and thickness of the lining epithelium

RESULTS

A total number of 119 specimens were reviewed. The age range of 106 patients ranged from five to seventy-five years (ages for the remaining 13 patients were unknown). The mean age with standard variation (± SD) was 30.2 ± 17.3 years. The median age was 26 years. The peak incidence was in the second and third decades (Figure 1).

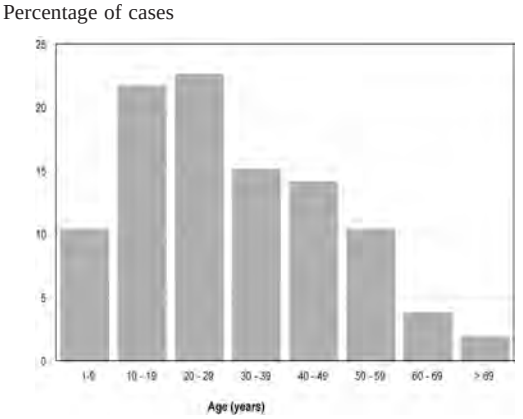

FIG. 1: Percentage of dentigerous cyst according to age stratification (n=106)

Male subjects in this study made up 63.9% of all patients. The male-to-female ratio was 1.77. The majority of the patients were Chinese (70.5%). No information in respect to ethnic origin and sex was available in 11 records. The location of the lesions was almost equal to the maxilla (50.9%) and the mandible (49.1%) There was a marked predilection for the posterior mandible (42.7%) followed by the anterior maxilla (38.2%) (Table 1).

One hundred and eight (90.8%) cases were lined by non-keratinized stratified squamous epithelium (NKSSE) while fourteen cases (5.9%) were lined by a parakeratinised stratified squamous epithelium (PKE) (Table 2). Pseudostratified ciliated columnar epithelium and mucous metaplasia were observed in 9 (7.6%) cases. It was observed that two cases were lined by pseudostratified ciliated columnar epithelium only and one case of which each was lined by orthokeratinised stratified squamous epithelium only and thin cuboidal epithelium only (Table 2).

The cyst linings were mainly thin (90.0%) with 38.7% of cases having a mixed thick and thin lining. A more non-branching proliferation

TABLE 1: The anatomical location of dentigerous cysts (n=119) in Singaporeans and Malaysians

Location	Number (N= 119)	Percentage (%)
Anterior maxilla	42	38.2
Posterior maxilla	14	12.7
Anterior mandible	7	6.4
Posterior mandible	47	42.7
Total	110	100.0
Missing information	9	

TABLE 2: Type of cyst lining in dentigerous cysts in Singaporeans and Malaysians

Type of epithelium	Number (N=119)	Percentage (%)
1) Non-keratinised stratified squamous epithelium (NKSSE)	108	
a) NKSSE only	94	
b) NKSSE and PKE	1	
c) NKSSE and PSC	3	
d) NKSSE, PSC and MM*	6	
e) NKSSE and MM*	3	
f) NKSSE and thin cuboidal epithelium	1	
2) Parakeratinised stratified squamous epithelium (PKE)	7	5.9
a) PKE only	6	
b) PKE and NKSSE	1	
3) Orthokeratinised stratified squamous epithelium only	1	0.8
4) Pseudostratified ciliated columnar epithelium only	2	1.7
5) Thin cuboidal epithelium only	1	0.8
TOTAL	119	100.0

* Mucous metaplasia was observed in 9 (7.6%) cases.
Type of cyst lining:
NKSSE = Non-keratinised stratified squamous epithelium
PKE = Parakeratinised stratified squamous epithelium
PSC = Pseudostratified ciliated columnar epithelium
MM = Mucous metaplasia

of basal epithelial layer was observed in 97 (81.5%) cases (Figure 2) while a mixed non-branching and branching proliferation of basal epithelial layer (Figure 3) was observed in 17 cases (14.3%) (Table 3).

Table 4 shows the distribution of cells and structures within the epithelial lining. Polymorphonuclear leukocytes were present in 50 (42.0%) cases. Rushton bodies were seen in 3.4% (4 cases) of cases. Cholesterol clefts in the epithelial lining and lumen were found in 20 cases (16.8%) while 12.6% of cases exhibited cholesterol clefts in the cyst wall. Other cellular structures within the cyst wall were lymphocytes (66.4%), plasma cells (52.1%), polymorphonuclear leucocytes (37.0%), Russell bodies (16.0%) and histiocytes (4.2%). Bone fragment (32.0%) and root fragment (3.4%) were also observed within the cyst wall.

Epithelial atypia was seen in 11 cases (9.2%), islands of squamous epithelial cells were observed in 10 cases (8.4%) while one case showed a combination of these two features (Table 5). Odontogenic keratocysts were observed in 6 cases (5.0%) and one of case of adenomatoid odontogenic tumour was also observed. The histopathology of odontogenic keratocysts (Figure 4) and the adenomatoid odontogenic tumour (Figure 5) were found in dentigerous cyst locations as determined by the specific clinical/radiological criteria described in the biopsy forms.

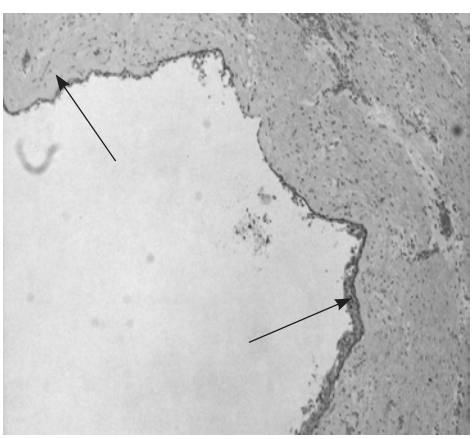

FIG. 2: A haematoxylin and eosin-stained section illustrating a thin non-keratinised stratified squamous epithelium with no branching rete ridges. Arrows showing thin non-keratinized epithelium with no branching. Original magnification 10X.

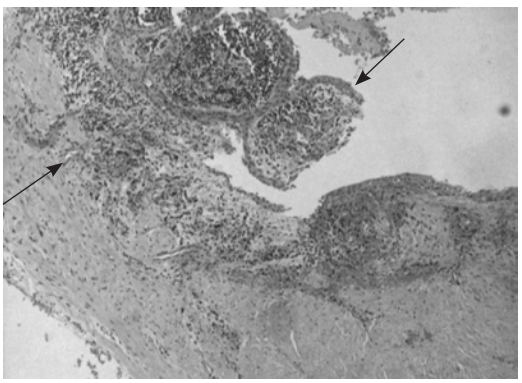

FIG. 3: A haematoxylin and eosin-stained section illustrating a thick non-keratinised stratified squamous epithelium illustrating branching rete ridges. Arrows showing non-keratinized epithelium with branching rete ridges forming arcades. Note the inflamed cyst wall associated with the branching epithelium. Original magnification 10X.

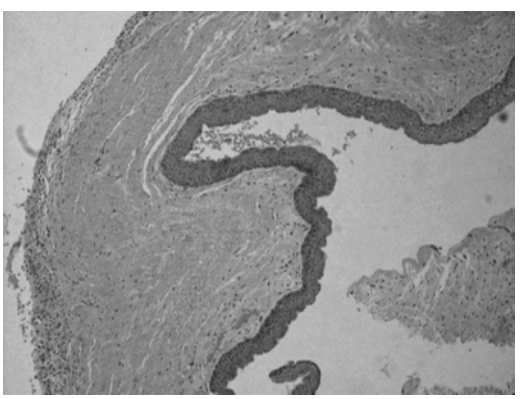

FIG. 4: A haematoxylin and eosin-stained section illustrating a thin parakeratinised stratified squamous epithelium with no branching rete ridges seen in odontogenic keratocysts. Pallisading basal cell nuclei is evident. Original magnification 25X

DISCUSSION

Clinical data

Dentigerous cysts have been well studied. However these data were largely limited to relative frequency or incidence of the cysts with little information on the histopathological features of the cyst. These studies were also largely based on a predominantly Caucasian and South African population.[2,5-12] There is little data on the Oriental population, specifically the population from the Southeast Asian region. A study was done on cysts of the jaw in the Malaysian population but this study was confined to presenting clinical data such as sex, mean age and location of lesion.[13] Studies on the Malaysian population have indicated that dentigerous cysts make up 15% of cystic lesions of the jaw.[13]

The present study found that the mean age at presentation for the dentigerous cysts was 30.2 years. This is close to that reported in an earlier Malaysian study[13] and that reported by Mourshed (32.3 years).[10] The age range of the patients in this study were from five to seventy-five years, very close to Mourshed's four to seventy-five years.[10] The median age of 26 years however, was a five-year difference from Mourshed's report of 31 years.[10]

The lowest incidence was in the first decade of life. The peak incidence was in the second and third decades. Both the finding is also similar to Mourshed's finding.[10] In contrast, Browne[14] in 1972 reported an increasing prevalence up to the fifth decade while our study showed the peak prevalence to be in the third decade, similar to Mourshed's finding.[10] Mourshed suggested that the age incidence of dentigerous cyst closely allied to growth and development of teeth.[11] In the second decade, all the permanent teeth have erupted, with the exception of some third molars. Since the mandibular third molars are the teeth related most closely to the dentigerous cyst, the incidence of such cysts in the second decade of life is of limited prevalence (more than the first

TABLE 3: Other histological features of lining epithelium in dentigerous cysts in Singaporeans and Malaysians

	Proliferation of basal epithelial layer			Thickness of epithelial lining		
	Non-branching	Branching	Branching & non branching	Thick	Thin	Thick & thin
Number	97	5	17	12	61	46
Percentage (%)	81.5	4.2	14.3	10.0	51.3	38.7
Total	119 (100%)			119 (100%)		

TABLE 4: Distribution of cells and structures within the epithelial lining

CELLS/STRUCTURES	Number (N=119)	Percentage (%)
Within the epithelial lining		
Polymorphonuclear leucocytes/lymphocytes	50	42.0
Rushton bodies	4	3.4
Cholesterol clefts (including those in cyst lumen)	20	16.8
Within the cyst wall		
Polymorphonuclear leucocytes	44	37.0
Lymphocytes	19	66.4
Cholesterol clefts	15	12.6
Russell bodies	19	16.0
Plasma cells	62	52.1
Histiocytes	5	4.2
Bone fragment	38	32.0
Root fragment	4	3.4

decade of life, but less than the third decade of life).

The greatest incidence of dentigerous cyst occurred between age 21 and 30 years. In this age period, the third molar has completed the process of development (it erupts between the age of 16 and 25 years). Thus, it would be in this age period that the dentigerous cyst would develop in association with unerupted or impacted third molars. Mourshed suggested that in the next periods of life, there is a gradual decrease in the occurrence of the dentigerous cyst.[10] The decline in the occurrence of dentigerous cysts is due to the fact that most of the unerupted or impacted teeth and dentigerous cysts have received treatment prior to these later age periods. Browne[14] had reported an increasing prevalence up to the fifth decade, and we suspect the reason behind this is the late discovery of dentigerous cysts.

There were a larger number of male subjects (63.9%) as compared to female. This finding is similar to an earlier Malaysian study[13] and that reported by Mourshed[10] and Shear.[2] Mourshed in a review of 180 dentigerous cysts reported a male to female ratio of 1.6:1.[10] Our findings, coupled with those by Shear's[2] and Mourshed's[10] are at odd with the result of another study by Mourshed[12] whereby seven out of eight patients having dentigerous cysts were females.

As for ethnic group distribution, the majority was Chinese; which is not surprising as the sample population was from Malaysia and Singapore, Singapore being predominantly Chinese. The population distribution of Chinese: Malays: Indians: Others in Malaysia is 26%:51%:8%:3% respectively (12% are the indigenous people of Sabah and Sarawak)[15] while the distribution for Singapore is 76.7% Chinese, 13.9% Malay, 7.9 % Indian and 1.5 % others.[16]

The main location of the dentigerous cysts is closely associated with the teeth in the dental arch that are most frequently unerupted. These are the areas surrounding the third molars, canines and premolars. The maxilla is slightly more affected than the mandible; 50.9% against 49.1%. This is similar to the finding in an earlier Malaysian study.[13] In contrast, Mourshed reported a higher predilection for the mandible (74%).[10] In our

TABLE 5: Other histological features

Features	Number (N=119)	Percentage (%)
Islands of squmaous epithelial cells	10	8.4
Epithelial dysplasia *	11	9.2
Adenomatoid odontogenic tumour	1	0.8
Odontogenic keratocyst	6	5.0

* One of these is a combination of epithelial dysplasia and squamous epithelial islands

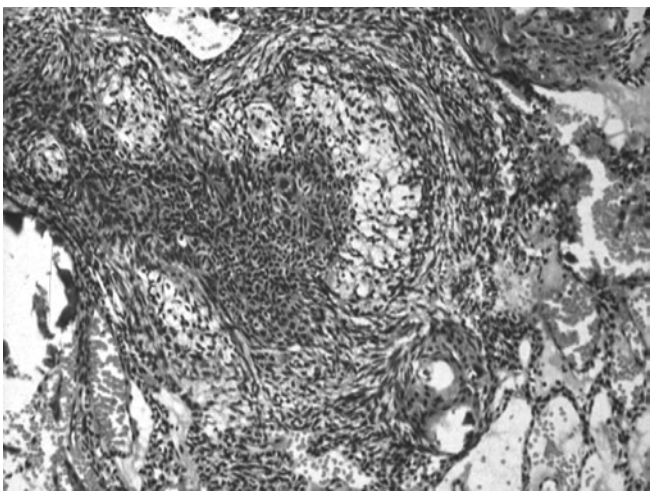

FIG. 5: A haematoxylin and eosin-stained section illustrating luminal nodules consisting of odontogenic epithelium arranged as typical patterns of adenomatoid odontogenic tumour. Original magnification 50X.

study, the location of the lesion was more often in the posterior mandible (42.7%) and anterior maxilla (38.2%), a finding similar to that reported in the earlier Malaysian study.[13] This is perhaps, due to the frequent association with an impacted lower third molar or upper canine, and sometimes even upper supernumerary teeth. Shear[2] had reported a similar order of frequency. Mourshed instead, reported a higher predilection for posterior mandible followed by posterior maxilla.[10]

Histopathological features

The cyst lining was predominantly non-keratinised stratified squamous epithelium (90.8%). Interestingly, there were a large number of specimens showing inflammation of the epithelial lining (42.0%). Inflammation is not a usual feature in dentigerous cyst.[3] It can be postulated that this is due to later detection of dentigerous cysts here as compared to other regions. Benn and Altini[17] presented what they termed dentigerous cyst of inflammatory origin but we are unable to confirm whether our dentigerous cyst comply with their definition.

Parakeratinisation was seen in 5.9% of the cysts, with orthokeratinisation seen in only one case. Vuhahula *et al*.[18] are of the opinion that due to the pluripotentiality of odontogenic cyst epithelium, the reduced enamel epithelium which has completed its tooth forming function has the capability to keratinise under appropriate stimuli, thus forming a true dentigerous cyst with keratin. Their finding was that the type of keratin formed was more likely to be orthokeratin. However, this study shows a higher percentage of parakeratin formation. Keratin metaplasia can lead to malignancy. There is also a danger of misdiagnosing a dentigerous cyst with keratinisation as an odontogenic keratocyst.[19]

There was differing thickness for the lining epithelium; as expected the majority (51.3%) had a thin lining. More than thirty-eight percent (38.7%) had a mixed thick and thin lining, and 10% had a thick lining. The increase in lining thickness may be due to the increased occurrence of inflammation as mentioned earlier, whereby the epithelium becomes thicker and more squamous.[3]

In this study, one of the specimens showed an association with adenomatoid odontogenic tumour. This association concurs with the study by Giansanti, Someren and Waldron.[20] They found that 74% of odontogenic adenomatoid tumours were associated with dentigerous cysts or with the crowns of impacted teeth. However, our finding could also be due to a less than stringent selection of cases whereby an only clinical/radiographic criterion was used.

Of the total number of specimens seen, six showed histological features of odontogenic keratocysts. Historically there has been confusion of odontogenic keratocysts with dentigerous cysts in that they were not classified separately.[19] There is great importance in correct classification as the treatment and prognosis would vary. Radiographically, keratocysts are frequently observed in a pseudodentigerous position, that is in relation to the crown of an unerupted tooth. Thus these lesions are frequently

misdiagnosed as dentigerous cysts. Forsell[21] reported this relationship in 41% of a series of 135 cases. Altini and Cohen[22] used the term follicular primordial cyst to describe a keratocyst developing a dentigerous relationship with an erupting tooth, when the tooth erupts into a preexisting keratocyst in the same way a tooth erupts into the oral cavity.

Brannon[23] have mentioned the frequent association between orthokeratinised cysts and the crowns of unerupted teeth. The relatively less aggresive behaviour of some of these in comparison to other odontogenic keratocysts, is said to be because they are in fact dentigerous cysts which have become keratinised and not odontogenic keratocysts. Vuhahula *et al*.[18] have suggested that dentigerous cysts with orthokeratinisation be referred to as odontogenic jaw cysts as they are clinicopathologically different entities from odontogenic keratocysts.

In conclusion, some clinical features seen in this study are similar to that for the Caucasian population such as prevalence in male, peak incidence in the second and third decades and the predilection for the posterior mandible and anterior maxilla. Histopathologically, odontogenic keratocyst and adenomatoid odontogenic tumour were observed in dentigerous cysts. As there is a danger of misdiagnosing keratocysts and adenomatoid odontogenic tumour in a dentigerous cyst location, it is important that the final diagnosis should be done using histopathological methods in addition to radiographic and clinical examination.

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