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Odontogenic tumors: A study of 120 cases in an Indian teaching hospital

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Abstract

Objective: Studies on odontogenic tumors published from many parts of the world show a distinct geographic variation; however, there is little information available in the English-language literature on the relative frequency of odontogenic tumors in India. This retrospective study was designed to determine the relative frequency of odontogenic tumors in an Indian population and compare them with various reports from other parts of the world.

Study design: The histopathology records of the Department of Oral Pathology and Microbiology of Government Dental College and Hospital, Mumbai were retrieved retrospectively within the period of January 2001 to July 2010. A total of 120 lesions classified as odontogenic tumors were reviewed. These were analyzed for age, gender, site of tumor and histopathologic typing. Criteria used were World Health Organization (WHO) classification 2005. The mandible and maxilla were divided into 4 anatomic regions, and the distribution of each odontogenic tumor among these regions was recorded and analyzed.

Results: A total of 120 cases of odontogenic tumors were reported in this period. Odontogenic tumors in the present study constituted 5.78% of all the 2075 registered biopsies. The most frequent histological type was ameloblastoma (40.83%), followed by Keratocystic odontogenic tumor (37.5%), odontome (11.66%) and adenomatoid odontogenic tumor (5.8%). In general, the odontogenic tumors showed a predilection for the mandible and the posterior regions of the jaws. Ameloblastomas occurred with a marked predilection for the mandible, while adenomatoid odontogenic tumor showed predilection for the maxilla, anterior regions of the jaws, and young females.

Conclusion: A frequency of 5.78% of odontogenic tumors was observed in this study. Ameloblastoma comprised the single most common tumor of all odontogenic tumors. This study observed geographic variations in the frequency and distribution of odontogenic tumors.

Key words: *Odontogenic tumor, ameloblastoma, keratocystic odontogenic tumor, jaws.*

Introduction

Odontogenic tumors (OT) are heterogeneous lesions derived from epithelial or ectomesenchymal tissues or both, which are part of the tooth-forming apparatus. They range from hamartomatous or nonneoplastic tissue proliferations to malignant neoplasms with metastatic capacity. In humans, tumors of the odontogenic tissues are comparatively rare, comprising about 1% of all oral and maxillofacial biopsy specimens diagnosed (1). Several retrospective studies carried out in Africa, Asia, Europe, and America, show that differences exist in the relative frequency of the various histologic types. World Health Organization (WHO) published the first edition of the "Histological Typing of Odontogenic Tumors" in 1971 (2), then the second edition in 1992 (3). The latter was widely cited ever since when reporting large series or isolated cases of OTs. However, because of diversity of OTs, there are still many controversies concerning classification, terminology and diagnosis of these lesions. In 2005 the third edition of WHO histological typing was published in which definitions of some pathological entities have been changed and some new ones have been introduced (4).

Available literature on the relative frequency of odontogenic tumors are mostly among Americans and Africans. Very few studies are reported among Asians, especially from the Indian subcontinent. The aim of the present study was to determine the epidemiology and clinicopathologic presentation of this heterogeneous group of lesions seen at the Government Dental College and Hospital, Mumbai, India, over the period of January 2001 to July 2010 and to compare these data with previous reports.

Materials and Methods

The pathology records of the Department of Oral Pathology and Microbiology of Government Dental College and Hospital, Mumbai, India, were reviewed retrospectively for all of the lesions of the oral cavity and jaws seen from January 2001 to July 2010. A total of 120 lesions were classified as intraosseous odontogenic tumors during this period. All cases were analyzed for age, gender, site of tumor, and histopathologic typing. The identified odontogenic samples were reviewed in accordance with 2005 World Health Organization classification of odontogenic tumors (4).

The maxillary lesions were divided into 2 categories based on the radiographic extent. Class 1 consisted of lesions limited to the anterior segment of maxilla (distal aspect of right canine to distal aspect of left canine). Class 2 consisted of lesions limited to the posterior segment of maxilla (from mesial aspect of first premolar distally). (Fig. 1)

Similarly, the mandibular lesions were divided into 2 categories. Class 1 consisted of lesions limited to the anterior segment of mandible (distal aspect of right canine to distal aspect of left canine). Class 2 consisted of lesions limited to the posterior segment of mandible (mesial aspect of first premolar to distal aspect of third molar and beyond) (Fig. 1).

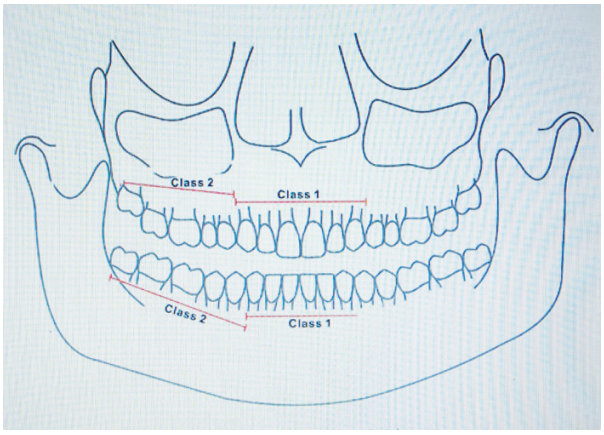

Fig. 1. Anatomic division of maxilla and mandible into 4 region.

Results

The relative frequency was 5.78% (120 odontogenic tumors) of all oral biopsied samples encountered between January 2001 and July 2010. Of the 120 odontogenic tumors, all were benign. Among these 70 were in males and 50 were in females (male- female ratio 1.4:1).

88 tumors were encountered in the mandible and 32 in the maxilla, with an overall mandible: maxilla ratio of 2.75:1.

Table 1 shows the frequency, gender, and site distribution for different pathologic types of tumors listed according to the WHO International Classification of Odontogenic Tumors (4).

Ameloblastoma was the most frequent benign tumor (40.83%, 49 cases). The second most common tumor was keratocystic odontogenic tumor (KCOT) (37.5%, 45 cases), followed by odontoma (11.66%, 14 cases), and adenomatoid odontogenic tumor (AOT) (5.8%, 7 cases), which is followed by other odontogenic tumors like squamous odontogenic tumor (SOT) (0.83%, 1 case), Calcifying epithelial odontogenic tumor (CEOT) (0.83%, 1 case), Calcifying cystic odontogenic tumor (CCOT) (0.83%, 1 case), Ameloblastic fibroma (0.83%, 1 case) and Cementoblastoma (0.83%, 1 case). Gender analysis showed a female predilection for most of the tumors except ameloblastoma and KCOT.

As shown in table 2, odontogenic tumor in this study population affected patients over a wide age range of 5-75 years. Age distribution showed a peak occurrence in the third decade, 85% of the cases occurring bet-ween the second and fifth decades. Ameloblastoma, the most common tumor in this study showed 71.42% of the cases occurring in the third to fifth decades. KCOT showed 88.88% of the cases occurring in second to fifth decades.

Table 1. Distribution of odontogenic tumors.

	Total		Gender		
	Number	**Percentage**	**Male**	**Female**	**Male:Female**
Ameloblastoma	49	40.83	28	21	1.3
KCOT	45	37.5	30	15	2
Odontoma	14	11.67	7	7	1
AOT	7	5.83	3	4	0.75
SOT	1	0.83	1	0	NA
CEOT	1	0.83	0	1	NA
Ameloblastic fibroma	1	0.83	0	1	NA
CCOT	1	0.83	0	1	NA
Cementoblastoma	1	0.83	1	0	NA
Total	120		70	50	1.4

SOT: Squamous odontogenic tumor; CEOT: Calcifying epithelial odontogenic tumor; CCOT: Calcifying cystic odontogenic tumor; KCOT: Keratocystic odontogenic tumor; AOT: Adenomatoid odontogenic tumor. NA: Not applicable.

Table 2. Distribution of odontogenic tumors in decades of life (years).

Tumor/ Age	**0-9**	**10-19**	**20-29**	**30-39**	**40-49**	**50-59**	**60-69**	**70-79**	**TOTAL**
Ameloblastoma	0	6	12	12	11	5	2	1	49
KCOT	1	12	12	9	7	3	1	0	45
Odontoma	1	6	4	0	2	0	1	0	14
AOT	0	5	2	0	0	0	0	0	7
SOT	0	0	0	0	0	0	1	0	1
CEOT	0	0	0	1	0	0	0	0	1
Ameloblastic fibroma	0	0	1	0	0	0	0	0	1
CCOT	0	0	0	0	0	0	1	0	1
Cementoblastoma	0	0	1	0	0	0	0	0	1
Total	2	29	32	22	20	8	6	1	120

Table 3. Distribution of odontogenic tumors by site of occurrence.

	Maxilla			Mandible			Mand:Max
Tumor type	Class 1	Class 2	Total	Class 1	Class 2	Total	
Ameloblastoma	4	1	5	5	39	44	8.8
KCOT	9	4	13	3	29	32	2.46
Odontoma	7	0	7	3	4	7	1
AOT	6	0	6	1	0	1	0.16
SOT	0	0	0	0	1	1	NA
CEOT	0	1	1	0	0	0	NA
Ameloblastic fibroma	0	0	0	0	1	1	NA
CCOT	0	0	0	1	0	1	NA
Cementoblastoma	0	0	0	0	1	1	NA
Total	26	6	32	13	75	88	2.75

SOT: Squamous odontogenic tumor; CEOT: Calcifying epithelial odontogenic tumor; CCOT: Calcifying cystic odontogenic tumor; KCOT: Keratocystic odontogenic tumor; AOT: Adenomatoid odontogenic tumor. NA: Not applicable

Table 3 shows the distribution of odontogenic tumors by site of occurrence. The mandible was affected in 88 cases (73.33%) and maxilla in 32 cases (26.67%).The mandible was clearly the more common site of occurrence for most odontogenic tumors, with a ratio of 2.75:1. In the maxilla, the anterior region was the predominant site of involvement (13 cases), mostly contributed by AOT (6 cases) and odontoma (7 cases). The posterior region of the mandible was the frequent site of involvement in 75 cases. Ameloblastoma, showed a very high predilection for the mandible with 90% of the cases occurring in the mandible with a ratio of 8.8:1. It is worth mentioning that cases of adenomatoid odontogenic tumor had a predilection for the maxilla. In general, the odontogenic tumors were most commonly encountered in the posterior zone of the jaws, but adenomatoid odontogenic tumors defied this general finding and were more common in the anterior zone of the jaws. No statistically significant gender predilection for sites was found in this study.

Discussion

Information derived from the literature indicates that large published series on odontogenic tumors in Indian populations is limited to two reports (1, 5). Literature search also revealed no other published series from other southern Asian countries, such as Afghanistan, Bangladesh, Bhutan, Nepal, and Pakistan, except for a single report from Sri Lanka (6). However, data on odontogenic tumors are available for both western and northern China as well as Japan in the eastern Asian region (7,8).

The relative frequency of odontogenic tumors in the present study was 5.78% of the total biopsied specimens recorded between January 2001 and July 2010. This incidence is higher than the prevailing frequency in other studies from Asia (3.92%) (4). An African series recorded the highest frequency of 9.6% (9), whereas it was comparatively lower in North American (2.5%) (10), South American (1.29%) (11) and European series (0.74%) (12).

About 99.2% of OT in the present series were found in patients older than 5 years. Many odontogenic tumors are thought to arise from the tooth germ. In most permanent teeth, crown formation completes by the age of 4 or 5 years, which indicates that odontogenic tumors probably develop after crown formation. This strengthens the impression that the majority of odontogenic tumors arise from quiescent remnants of the tooth germ (1). In the present study, odontogenic tumors were most frequent in the second to fifth decades of life.

Most of the previous studies reported an equal gender distribution of odontogenic tumors but a female preponderance was reported by Regezi et al.(13) and Wu and Chan.(14); male predominance was reported by Odukoya (15). In the present series, we found almost equal distribution of occurrence between the genders (slightly more common in males). In general, the odontogenic tumors in this series occurred 2.75 times more commonly in the mandible than in the maxilla, which is in agreement with most of the previous studies (7, 15).

The present study found ameloblastoma to be the most frequent odontogenic tumor, accounting for 40.83%, followed by KCOT (37.5%), odontome (11.66%), AOT (5.8%) the rest of the tumors are negligible.

Ameloblastoma with marked predilection for the mandible was the most frequent tumor 40.83% in the present series. This is similar to other studies reported from India (1, 5), Africa (15), Turkey (16), Hong Kong (14), and China (7), but in contrast to those reported from Canada (17), Chile (11), Germany (18), U.S.A. (13), and Mexico (10), where odontoma is reported as the most common odontogenic tumor. This also strengthens the belief that ameloblastomas are more common in Asians and Africans compared with Caucasians. Although these observations indicate that the distribution of odontogenic tumors show distinct differences in their frequency, there is also a view that underreporting of odontomas in developing countries or the nature of institutional setup (medical college vs. dental college) could be the potential determinant in the differences in the frequency of odontogenic tumors, especially ameloblastoma and odontoma (19).

Almost 90% of ameloblastomas were located in the mandible, with a very high mandible to maxilla ratio (8.8:1). This is very high compared with the ratios reported by earlier studies. Reichart et al (20) in an extensive review of all of the cases reported in the literature, found the ratio to be around 5.4:1. The high occurrence in the mandible in the present institutional study may be due to loss of maxillary ameloblastomas to eye-nose-throat surgeons. In the present study, ameloblastomas were frequently encountered in the molar-ramus region in the mandible and the molar region in the maxilla.

KCOT is identified as a tumor in the current WHO classification and was not included in most previous surveys on OTs except recent studies from China (8, 21). It is the second most common tumor found in our study similar to the study by Jing et al.(8). The age and sex distribution of KCOT were in accordance with earlier series (22, 23), that is the most of the cases are diagnosed in second to fourth decades, male patients are frequently affected. Similar to ameloblastoma, solitary KCOT demonstrated a site predilection for posterior mandible. However, it is noteworthy that 28.88% of KCOT occurred in maxilla, much more frequent than maxillary ameloblastomas (10.20%).

Odontomas occurred in the present series with a relative frequency of 11.67%. They showed equal distribution in males and females and occurred mostly in younger individuals. The tendency to occur in the anterior region (71.42%) more than the posterior region (28.57%) was seen in both jaws. Similarly, the anterior maxilla was the

preferred site, followed by posterior mandible and posterior maxilla. Most odontomas are symptomless and discovered on routine radiographs. This may also be responsible for the low incidence in Indian population, because most patients in our environment do not seek medical consultation unless there are symptoms suggesting an obvious pathology. This geographic variation may also be due to genetic and/or environmental influences.

Adenomaoid odontogenic tumor (AOT) occurred in the present series with frequency of 5.8%. It is the fourth most common tumor which is found to be in contrast with other studies from India (1, 5) and Sri Lanka (6), where it was the second most common tumor. The female predilection of AOT is supported by earlier reports (1, 8, 10, 15). The second decade involvement (71.42%) noted in the present study, is similar to other series (1, 5, 8, 15). AOT also showed predilection for the maxilla and anterior regions of the jaws, unlike other odontogenic tumors. Compared with ameloblastomas, AOT occurs at a significantly lower age. Based on the fact of AOT being a well encapsulated tumor that expands centrifugally, i.e. equally in all directions, we hypothesize that AOT may cause expansion of the cortical plates at an early stage compared with ameloblastomas, which spread linearly within the cancellous bone before causing expansion/resorption of the cortical plates. Furthermore, AOTs occur more frequently in the anterior region, which might alert the individual to seek attention at an earlier stage.

The lower numbers of other benign odontogenic tumors like SOT, CEOT, CCOT, Ameloblastic fibroma and Cementoblastoma (one case each) were too negligible to draw any meaningful observation. They represent 0.83% of the odontogenic tumors. The frequency of these neoplasms in other series was also lower, confirming the rarity of these tumors.

In conclusion, we observed a marked geographic variation in the relative incidences of various odontogenic tumors. This was particularly notable in ameloblastomas and odontomas, with the incidences observed in the present study being similar to previous studies from Africa and Asia and in contrast to those reported from American and European countries. Since most data on the frequency of OTs are derived from hospital based records which may be biased by some socioeconomic factors, the role genetic and/or environmental factors in modulating in geographic variations in the incidence of OTs requires further investigations.

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