Comparison of occurrence of oro-maxillo-facial tumor types in different regions of the People's Republic of China

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Abstract: The frequencies of oro-maxillo-facial tumors, by type, seen at the Guangxi Medical College Hospital were surveyed in order to compare different regions of the People's Republic of China. Computer analysis was performed on data for all oro-maxillo-facial tumors, as confirmed by the hospital between 1957 and 1987, inclusive. The results were then used in a comparative study with those of five other medical colleges. Among a total of 4,052 cases, there were 1,593 benign tumors, 2,049 malignant tumors and 410 unknown tumors. Tumors derived from the epithelium were the most common type (42.0 % of the total), whereas in the other five medical colleges the mean corresponding proportion was 27.8 %, the difference being significant ($p < 0.05$). Epithelial tumors were also the most common type of malignant tumor (70.5 % of the total), whereas the corresponding proportion reported by the other five institutions was 60.6 %, which was also significantly different ($p < 0.05$). The proportion of malignant tumors among the total was more than 50.6 %, which was higher than that reported by the other five colleges. This study shows that epithelium-derived tumors and malignant tumors were encountered more frequently at Guangxi Medical College than at the other five medical colleges in China. (J. Oral Sci. 42, 57-62, 2000)

Key words: pathology; People's Republic of China; oro-maxillo-facial tumors; betel nut chewing.

Introduction

Few epidemiological studies of oro-maxillo-facial tumors in the People's Republic of China have been reported. Malignant tumors in this body region have been shown to be more common than in the rest of the body (1), but no investigation has been conducted in the Guangxi Autonomous District, nor has any study compared its rates of oro-maxillo-facial tumors with other hospital-based data from the People's Republic of China.

Guangxi Medical College Hospital is located in Nanning, Guangxi Autonomous District, in the southern part of the People's Republic of China, which has a population of about 400 million. It is the only medical college in this district and, with the most highly developed technology of the area, oversees the use of medical facilities. Therefore, the clinical pathology of all the cases treated by this college will likely reflect the distribution of diseases in the area as a whole. Accordingly, the distribution of oro-maxillo-facial tumors dealt with by the college was analyzed from the standpoint of clinical pathology. The results obtained were compared with those from five other medical colleges in China (Huaxi Medical College, Beijing Medical College, Second Shanghai Medical College, Hubei Medical College and The Fourth Military Medical College).

Materials and Methods

We performed a computer analysis of 4,052 cases of oro-

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maxillo-facial tumors, which had been confirmed by the Department of Oral Pathology, Guangxi Medical College Hospital, from 1957 to 1987. During the 30 years of this study period, all cases were classified histopathologically and/or on the basis on the source of the tumors. The frequency of tumors in each subclassification was estimated with a 98.0% confidence interval; $2(k+1)F_0/2(k+1)F_0+2(n-k+1) \geq p \geq 2(n-k+1)/2(k+1)F_0+2(n-k+1)$. Z-tests were used to determine the significance of differences in frequency between classifications and subclassifications.

The histological grading used in this study was based on the "Histological grading of oral soft tissues" by the World Health Organization, 1971 (2). The results were then used in a comparative study with those of the other five medical colleges. The data from these were obtained from a standard oral pathology textbook (3), one of whose editors was also a co-worker in this study. The textbook was compiled from the pathological data collected from the other five medical colleges by the co-worker to ensure data integrity for use in a comparative analysis, and the classifications were checked using it (Tables 1,2). This

enabled us to carry out a valuable comparative epidemiological study.

Results

Distribution of oro-maxillo-facial tumors according to tumor source

Table 3 shows the distribution of all oro-maxillo-facial tumors dealt with at Guangxi Medical College Hospital compared with those of the other five medical colleges in the People's Republic of China, according to tumor source. A total of 4,052 cases were registered, among which odontogenic tumors accounted for 3.6 %, salivary gland tumors 20.6 %, neurogenic tumors 9.4 % and other types 66.4 %. 'Other types' were subdivided into epithelial tumors (42.0 %), mesenchymal tumors (24.3 %) and mixed tumors (0.1 %).

By contrast, among the 20,089 cases seen at the other five medical college hospitals during the same period, 4.8 % were odontogenic tumors, 22.8 % were salivary gland tumors, 9.7 % were neurogenic tumors and 62.7 % were other types. 'Other types' was subdivided into epithelial

Table 1 The classification of odontogenic tumor (Shing, 1986)

Odontogenic epithelium	Benign	Ameloblastoma
		Odontogenic adenomatoid tumor
		Calcifying epithelial odontogenic tumor
		Calcifying odontogenic cyst
		Primary intra-osseous carcinoma
	Malignant	Malignant ameloblastoma
		Odontogenic fibroma
		Odontogenic myxoma
		Dentinoma
		Cementoma
Odontogenic ectomesenchyme	Benign	1)Benign cementoblastoma
		2)Periapical cemental dysplasia
		3)Cementifying fibroma
		4)Gigantiform cementoma
		Odontogenic (fibro)sarcoma
	Malignant	Ameloblastic fibroma
		Ameloblastic odontoma
		Odontoma
		1)Complex odontoma
		2)Compound odontoma
Odontogenic epithelium with odontogenic ectomesenchyme	Malignant	Ameloblastic fibrosarcoma
		Ameloblastic odontosarcoma

Table 2 The classification of salivary gland tumor (Shing, 1986)

Epithelial tumor	Benign	Pleomorphic adenoma
		Oxyphilic adenoma
		Adenolymphoma
		Basal cell adenoma
		Papillary cystadenoma
	Malignant	Malignant pleomorphic adenoma
		Adenoid cystic carcinoma
		Acinic cell carcinoma
		Mucoepidermoid carcinoma
		Papillary cystadenocarcinoma
		Adenocarcinoma
		Squamous cell carcinoma
		Undifferentiated carcinoma
Ectomesenchymal tumor	Benign	Fibroma
		Lipoma
		Haemangioma
		Lymphangioma
		Neurofibroma
	Malignant	Fibrosarcoma
		Malignant lymphoma
		Malignant melanoma

Table 3 The source of origin about oral tumors in the Guangxi Medical College Hospital compared with other five medical colleges in China

The source of origin	Subdivided group	Guangxi			Other five medical colleges		
		Number	Percentage(%)	Appearance rate(%)	Number	Percentage(%)	Appearance rate(%)
Odontogenic tumors		146	3.6	2.8 ~ 7.6 **	973	4.8	4.4 ~ 5.5
Salivary gland tumors		833	20.6	20.6 ~ 22.3 **	4,569	22.8	20.9 ~ 25.3
Neurogenic tumors		381	9.4	8.6 ~ 9.4 n.s.	1,941	9.7	8.8 ~ 10.9
Others	Epithelial tumors	1,702	42.0	0.4 **	5,588	27.8	25.7 ~ 30.7
	Mesenchymal tumors	984	24.3	22.4 ~ 24.3 **	6,979	34.7	32.4 ~ 37.9
	Mixed tumors	6	0.1	0.1 ~ 0.3 n.s.	39	0.2	0.1 ~ 0.3
Total		4,052	100.0		20,089	100.0	

tumors (27.8 %), mesenchymal tumors (34.7 %) and mixed tumors (0.2 %). The proportion of epithelial tumors relative to all oro-maxillo-facial tumors dealt with at Guangxi Medical College Hospital was significantly higher, while the rates of odontogenic, salivary gland and mesenchymal tumors were significantly lower than those of the other five medical colleges ($p < 0.05$).

Distribution of tumor types in the subclassifications

A histological breakdown of odontogenic tumors (146 cases) seen at Guangxi Medical College Hospital (Table 4) showed that the most common tumor type was ameloblastoma (80.8 %, $p < 0.01$), followed by odontoma (5.5 %). The histological breakdown of salivary gland tumors (833 cases) in this hospital (Table 5) showed that the most common tumor was pleomorphic adenoma (40.2 %, $p < 0.05$), followed by adenocarcinoma (16.1 %), malignant pleomorphic adenoma (11.0 %) and adenoid cystic carcinoma (8.8 %). Of the neurogenic tumors (381 cases, including

Table 4 Histological classification of odontogenic tumors in this hospital

	Histologic classification	Number	Percentage(%)	Appearance rate(%)
Benign	Ameloblastoma	118	80.8	71.7 ~ 87.3
	Odontoma	8	5.5	2.5 ~ 12.1
	Cementifying fibroma	8	5.5	2.5 ~ 12.1
	Ameloblastic odontoma	4	2.7	0.9 ~ 7.9
	Ameloblastic fibroma	1	0.7	0.1 ~ 4.5
	Odontogenic myxoma	1	0.7	0.1 ~ 4.5
	Odontogenic fibroma	1	0.7	0.1 ~ 4.5
	Odontogenic fibrosarcoma	3	2.0	0.6 ~ 6.8
Malignant	Odontogenic myxosarcoma	2	1.4	0.3 ~ 5.7
	Total	146	100.0	

Table 5 Histological classification of salivary gland tumors in this hospital

	Histological classification	Number	Percentage(%)	Appearance rate(%)
Epithelial Benign	Pleomorphic adenoma	335	40.2	36.2 ~ 44.6
	Adenolymphoma	21	2.5	2.4 ~ 2.9
	Adenoma	21	2.5	2.4 ~ 2.9
	Papillary cystadenoma	10	1.2	0.6 ~ 2.5
	Oxyphilic adenoma	1	0.1	0.0 ~ 0.2
	Malignant Adenocarcinoma	134	16.1	14.8 ~ 17.6
Malignant	Malignant pleomorphic adenoma	92	11.0	8.9 ~ 19.4
	Adenoid cystic carcinoma	73	8.8	6.8 ~ 11.9
	Mucoepidermoid carcinoma	65	7.8	5.9 ~ 10.6
	Squamous cell carcinoma	29	3.5	2.3 ~ 5.4
	Acinic cell carcinoma	21	2.5	1.5 ~ 4.2
	Undifferentiated carcinoma	19	2.3	1.3 ~ 3.8
	Papillary cystadenocarcinoma	12	1.4	0.7 ~ 2.8
	Total	833	100.0	

Table 6 Histological classification of neurogenic tumors in this hospital

	Histological classification	Number	Percentage(%)	Appearance rate(%)
Benign	Pigmented nevus	256	67.2	59.2 ~ 74.4
	Neurofibroma	60	15.8	12.0 ~ 21.3
	Neurilemmoma	33	8.7	5.9 ~ 12.6
	Malignant melanoma	18	4.7	2.7 ~ 7.9
Malignant	Neurofibrosarcoma	9	2.4	1.1 ~ 4.9
	Unknown	5	1.3	0.4 ~ 3.4
Total		381	100.0	

melanogenic tumors), the most common tumor type was pigmented nevus (67.2 %), followed by neurofibroma (15.8 %) and neurilemmoma (8.7 %) (Table 6).

Squamous cell carcinoma, which accounted for about 80 % of all epithelial tumors, was the most common of this type of tumor (1,347 cases, $p < 0.01$), followed by papilloma (8.2 %) and basal cell carcinoma (3.8 %) (Table 7). Among the mesenchymal tumors (984 cases, Table 8-1), the most common tumor type was hemangioma (33.7 %), followed by lymphangioma (10.0 %) and non-Hodgkin lymphoma (8.8 %). Furthermore, the most common histogenesis of mesenchymal tumors (Table 8-2) was vascular tissue (50.2 %), followed by bony tissue (17.4 %), lymphoreticular tissue (13.0 %), and fibrous tissue (10.2 %).

Distribution of malignant tumors according to histological classification

Table 9 shows the distribution of the malignant oro-maxillo-facial tumors seen at Guangxi Medical College Hospital compared with those seen at the other five medical colleges, according to histological classification. A total

Table 7 Histological classification of epithelial tumors in this hospital

	Histological classification	Number	Percentage(%)	Appearance rate(%)
Benign	Papilloma	140	8.2	6.4 ~ 10.4
	Verruca senilis	58	3.4	2.5 ~ 4.7
Malignant	Squamous cell carcinoma	1,347	79.2	76.1 ~ 81.8
	Basal cell carcinoma	64	3.8	2.8 ~ 5.2
	Anaplastic carcinoma	37	2.2	1.5 ~ 3.2
Unknown		56	3.3	2.4 ~ 4.5
Total		1,702	100.0	

Table 8-1 Histological classification of mesenchymal tumors in this hospital

	Histological classification	Number	Percentage(%)	Appearance rate(%)
Benign	Hemangioma	333	33.7	31.6 ~ 37.9
	Lymphangioma	98	10.0	8.0 ~ 12.2
	Osteofibroma	51	5.2	3.7 ~ 7.0
	Fibroma	35	3.6	2.4 ~ 5.1
	Fibrosarcoma	31	3.2	2.1 ~ 4.5
Malignant	Non-Hodgkin lymphoma	87	8.8	6.9 ~ 11.0
Unknown		349	35.5	31.6 ~ 35.5
Total		984	100.0	

Table 8-2 The source of origin about mesenchymal tumors in this hospital

	Histogenesis	Number	Percentage(%)	Appearance rate(%)
Vascular tissue		494	50.2	46.1 ~ 52.8
	Fibrous tissue	100	10.2	8.2 ~ 12.5
	Bony tissue	171	17.4	15.1 ~ 21.8
	Lymphoreticular tissue	128	13.0	10.5 ~ 15.8
	Others	91	9.2	7.4 ~ 11.4
Total		984	100.0	

of 2,049 cases (50.6 % of all cases) were registered. Tumors classified as other types of epithelial tumors were the most common (70.5 %), followed by salivary gland tumors (21.7 %), and mesenchymal tumors (5.7 %). Squamous cell carcinoma was the most common epithelial tumor, comprising 33.2 % of all oro-maxillo-facial tumors, and 65.7 % of all malignant tumors. Of the 7,573 cases (37.7 % of all cases) registered at the other five medical colleges during the same period, epithelial tumors of other types were most common (60.6 %), followed by salivary gland tumors (25.4 %) and mesenchymal tumors (11.8 %). Squamous cell carcinoma accounted for 19.0 % of all oro-maxillo-facial tumors, and 50.3 % of all malignant tumors. Epithelial tumors were significantly more common, and salivary gland tumors significantly less common at Guangxi Medical College Hospital than at the other five medical colleges ($p < 0.05$). Of malignant tumors (2049 cases) at Guangxi Medical College Hospital, the most common tumor type was carcinoma (92.4 %), followed by sarcoma (7.4 %) and carcinosarcoma (0.2 %). Of the 7,573 cases at the other five medical colleges, the most common tumor type was carcinoma (86.1 %), followed by sarcoma (13.4 %), and carcinosarcoma (0.5 %) (Table 10).

Discussion

The number of oro-maxillo-facial tumors overall during the three decades of this study, 1957 to 1987, was less than that in Changsha Province during the two decades, 1961 to 1981 (1). The number of cases per year seen at Guangxi Medical College Hospital was only about 36 % of that seen at Changsha. One possible explanation for this difference is that the population of Guangxi Autonomous District is

less than that of Changsha Province: 817,331 and 1,227,535, respectively (4). The proportions of epithelial tumors (according to histological classification) and malignancy dealt with at Guangxi Medical College Hospital were larger than those reported by the other five medical colleges, and this is also of interest in relation to the connection between the ethnology of pathogenesis and epidemiologic oncology. The formation of tumor cells results from the action of both intrinsic and extrinsic factors (5). The most strongly suspected intrinsic factors include genetic differences, the effects of nutritional deficiencies, internal secretion and/or climate. The high incidences of salivary tumors in Eskimos, ameloblastoma in Africans and Koreans, and oral cancer in Indians, is related to racial predisposition, for example (6).

Extrinsic factors include various occupational and habitual stimuli associated with lifestyle. Most people who chew betel nuts live in South and South-east Asia (7-9), which has an estimated 10-25 % of the world's population (7). Addiction to betel nut must be widespread in Guangxi Autonomous District because this district is located in the southern part of China, being more southerly than the other five provinces investigated in this study, and also close to Hainan Island and Hunan Province, where betel addiction is very common (10,11). The habit of betel nut chewing is known from epidemiology to be an important etiological factor for oral submucosal fibrosis (OSF) (10,12) and to induce high-risk precancerous conditions (10) and/or oral cancer (13). If the entire population of China is considered to have descended from the ancient Han race, then extrinsic factors should also be considered; however, very many kinds of racial minorities are living

Table 9 The source of origin about oral malignant tumors in the Guangxi Medical College Hospital compared with other five medical colleges in China

The source of origin	Subdivided group	Guangxi			Other five medical colleges		
		Number	Percentage(%)	Appearance rate(%)	Number	Percentage(%)	Appearance rate(%)
Odontogenic tumors		5	0.2	0.1 ~ 0.3 n.s.	8	0.1	0.0 ~ 0.2
Salivary gland tumors		445	21.7	20.0 ~ 21.7 **	1,923	25.4	22.3 ~ 28.8
Neurogenic tumors		27	1.6	1.1 ~ 2.3 n.s.	150	2.0	1.6 ~ 2.5
Others	Epithelial tumors	1,448	70.5	70.5 **	4,592	60.6	56.4 ~ 64.7
	Mesenchymal tumors	118	5.7	4.6 ~ 7.1 n.s.	896	11.8	11.5 ~ 16.0
	Mixed tumors	6	0.3	0.1 ~ 0.7 n.s.	4	0.1	0.0 ~ 0.2
Total		2,049	100.0		7,573	100.0	

Table 10 Histological classification of malignant tumors in this hospital compared with other five medical colleges in China

Histological classification	Guangxi			Other five medical colleges		
	Number	Percentage(%)	Appearance rate(%)	Number	Percentage(%)	Appearance rate(%)
Carcinoma	1,893	92.4	90.6 ~ 93.5 **	6,523	86.1	78.0 ~ 87.3
Sarcoma	152	7.4	5.9 ~ 15.0 *	1,011	13.4	12.2 ~ 14.6
Carcinosarcoma	4	0.2	0.1 ~ 0.6 n.s.	39	0.5	0.4 ~ 0.5
Total	2,049	100.0		7,573	100.0	

throughout China at present, and the people of Guangxi Autonomous District - Zhuangs - are one of them (14). Epstein-Barr virus may be one extrinsic factor, because all Asian patients with nasopharyngeal carcinoma are seropositive for Epstein-Barr virus (15). This study showed a relatively high incidence of oral epithelial tumors and malignancy in the study area, and any multifactorial analysis will need to consider several possible contributory factors, as described above.

The frequency of ameloblastoma, which accounted for most odontogenic tumors, was similar to that reported in previous studies of Asian populations (16-19). On the other hand, there is geographic variation in the incidence of ameloblastoma (8,20). Wu and Chan (16) thought that this variation might be partly the result of controversy about the terminology and classification of odontogenic tumors. By contrast, the lower frequency of odontogenic tumors (6) compared with all tumors was due to the larger proportion of epithelial tumors in this study series.

As mentioned above, more than 50 % of the tumors surveyed were malignant. This is higher than the figure of 26.2 % for tumors in the body as a whole (3). The present findings also indicate that the frequency of oro-maxillo-facial malignant tumors is relatively high, in agreement with previous studies (3,21,22).

Although a large number of epidemiological studies have investigated oro-maxillo-facial tumors, the precise definition of the term 'oro-maxillo-facial tumors' has not yet been standardized. This problem applies without exception to all reports about these types of tumors in the Chinese population, and therefore a degree of uncertainty in comparative studies has remained. To overcome this problem, we had one co-worker collect the data from the other five medical colleges with the aim of standardizing the term 'oro-maxillo-facial tumors'. This original approach enabled us to carry out a useful comparative epidemiological study of oro-maxillo-facial tumors and obtain valuable results.

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