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Original article

Retrospective study of oral and maxillofacial lesions in older Taiwanese patients

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Retrospective study of oral and maxillofacial lesions in older Taiwanese patients

Objective: The aim was to provide information regarding oral and maxillofacial (OMF) lesions in an older Taiwanese population.
Background: The rate of increase of older people in Taiwan is expected to be rapid. OMF lesions are very frequent in the older population, but no studies have been performed on these lesions in Taiwan.
Materials and methods: OMF cases (between 2000 and 2011) in geriatric patients (≥60 years of age) with records of age, sex and histological diagnoses were retrieved from the Oral Pathology Department of our institution. These lesions were classified into four main categories: tumour/tumour-like reactive lesions, cystic/pseudocystic lesions, inflammatory/infective lesions and other miscellaneous lesions.
Results: Six thousand seven hundred and twenty-six lesions were collected from a total of 39 503 OMF lesions in older Taiwanese patients in this study. Most of these lesions were distributed in the inflammatory/infective group, followed by tumour/tumour-like reactive lesions. Squamous cell carcinoma was the most common lesion, and, additionally, there was a high frequency of oral potentially malignant disorders.
Conclusions: The present study showed trends similar to previous reports from other countries. However, some detailed information was different, perhaps due to the different criteria and different geographic distribution. Worthy of note, our results indicated that screening for oral potentially malignant disorder and oral malignancy in the older population is essential.

Keywords: oral lesions, older, oral health, epidemiology.

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Introduction

According to the report from the Department of Health in Taiwan (2003), the older population constitutes about 9.7% of the whole population of Taiwan, and the proportion is predicted to increase to 14% in 2020[1]. Therefore, the rate of increase of the older population in Taiwan is expected to be rapid, which implies that the geriatric population is becoming an important group in our country.

Oral and maxillofacial (OMF) examination, either clinical or histopathological, is important for the evaluation of the oral health condition of the older. Many clinical studies have discussed oral conditions of older populations of different countries[2–12]; however, to our knowledge, histopathological studies are relatively uncommon. In a review of the English literature, only five histological reports were found to focus on OMF lesions in older populations[13–17]. Furthermore, there are no histological studies of OMF lesions in the older population of Taiwan. Hence, the aim of the present study was to assess biopsied OMF lesions in geriatric Taiwanese patients, including analysis of age, sex and histological diagnosis. Moreover, our data were compared with those of other similar studies conducted in other countries[13–17].

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Table 1 Age and sex distribution in older Taiwanese patients with oral and maxillofacial lesions.

	Male	*Female*
60–69 years	2590	830
70–79 years	1641	1028
80–89 years	262	344
90–99 years	8	24
Total	4501	2226

Materials and methods

A total of 39 503 diagnosed lesions in the OMF region between 2000 and 2011 were analysed in the Oral Pathology Department of our institution. Within these 39 503 biopsies, a pool of 6726 samples from older patients (≥60 years of age) was collected (Table 1). Age, sex and histological diagnoses were recorded. These OMF lesions were classified into four main categories: tumour/tumour-like reactive lesions, cystic/pseudocystic lesions, inflammatory/infective lesions and other miscellaneous lesions. Specimens without a specific diagnosis were excluded.

Results

As shown in Table 1, the majority of the older patients in this study were distributed in the range of 60–69 years (50.8%), followed by 70–79 years (39.7%). Most of the older patients were male, with a male to female ratio of 2:1. Most OMF lesions in this study were categorised as tumour/tumour-like reactive lesions (58.2%), followed by inflammatory/infective lesions (36.6%), cystic/pseudocystic lesions (3.8%) and other miscellaneous lesions (1.4%) (Table 2).

The frequencies of the 12 most common OMF lesions in the older patients are listed in Table 3, with a total number of 4643, which comprised about 69.0% of all OMF lesions in the older patients. The most common disease was squamous cell carcinoma (12.8%), followed by candidiasis (10.2%), hyperkeratosis (10.2%), epithelial dysplasia (9.6%) and epithelial hyperplasia (6.5%); these top five common lesions comprised about 50% of all the OMF lesions in the older patients. On the other hand, oral submucous fibrosis (52.3%) and candidiasis (47.6%) were the first two most common lesions as compared, respectively, to the same lesions in all age groups.

As shown in Table 4, radicular cyst was the most common odontogenic cystic lesion (n = 209), consisting of more than 80% of the seven types of cystic/pseudocystic lesions of odontogenic origin. Dentigerous cyst was the second most common disease (n = 21), followed by residual cyst (n = 12). The number of male patients (58.3%) in this group was greater than the number of female patients (41.7%). Furthermore, residual cyst (20.3%) and radicular cyst (12.1%)

Table 2 Numbers and percentages of the four categories of oral and maxillofacial lesions in older Taiwanese patients.

Categories	*Number*	*% of the total*
Tumour/tumour-like reactive lesions		
Odontogenic (benign)	25	0.4
Non-odontogenic (benign)		
Bone	5	0.1
Salivary gland	17	0.3
Epithelial	1143	17.0
Soft tissue	292	4.3
Non-odontogenic (premalignant)		
Epithelial	1324	19.7
Non-odontogenic (malignant)		
Mesenchymal	9	0.1
Hematologic	8	0.1
Salivary gland	30	0.5
Epithelial	1049	15.6
Cystic/pseudocystic lesions		
Odontogenic	255	3.8
Non-odontogenic	13	0.2
Inflammatory/infective lesions	2459	36.6
Other miscellaneous lesions	97	1.4
Total	6726	100

Table 3 Numbers and percentages of the 12 most common oral and maxillofacial lesions in older Taiwanese patients.

	Number	*% of the older group*	*% of the same lesion in all age groups*
Squamous cell carcinoma	864	12.8	18.0
Candidiasis	686	10.2	47.6
Hyperparakeratosis	686	10.2	23.1
Epithelial dysplasia	647	9.6	31.6
Epithelial hyperplasia	436	6.5	26.1
Oral submucous fibrosis	342	5.1	52.3
Verrucous hyperplasia	335	5.0	20.2
Radicular cyst	209	3.1	12.6
Fibrous hyperplasia	130	1.9	23.0
Granulation tissue	115	1.7	13.7
Verrucous carcinoma	101	1.5	26.3
Pyogenic granuloma	92	1.4	18.6
Total	4643	69.0	

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Table 4 Number and sex distribution in older Taiwanese patients with odontogenic cysts.

Odontogenic cyst	*Male*	*Female*	*% of the same lesion in all age groups*
Radicular cyst	115	94	12.1
Dentigerous cyst	19	2	7.0
Residual cyst	6	6	20.3
Keratocystic odontogenic tumour	4	3	4.6
Grandular odontogenic cyst	2	0	100
Calcifying odontogenic cyst	2	0	11.1
Lateral periodontal cyst	1	1	40
Total	149	106	

Table 5 Number and sex distribution in older Taiwanese patients with non-odontogenic cysts/pseudocysts.

Non-odontogenic cyst/pseudocyst	*Male*	*Female*	*% of the same lesion in all age groups*
Epidermoid cyst	5	2	22.6
Nasopalatine duct cyst	2	0	15.4
Lymphoepithelial cyst	1	1	13.3
Branchial cleft cyst	1	0	50.0
Thyroglossal duct cyst	1	0	100
Total	10	3	

were the first two most common lesions compared, respectively, to the same lesions in all age groups.

The lowest number of lesions of all the OMF lesions in the older patients was noted to be in the non-odontogenic cystic/pseudocystic group (Table 5), which contained only 13 cases, the most common lesion being epidermoid cyst ($n = 7$). The second lowest number of lesions of all the OMF lesions was benign odontogenic tumours (Table 6), with ameloblastoma being the most common disease, comprising 50% of all the lesions in this group; the remaining 50% of lesions consisted of the other six types of disease. There were more male patients (72.0%) in this group than female patients (29.0%).

The highest number of lesions of all the OMF lesions in the older patients was distributed in the non-odontogenic tumour/tumour-like reactive group (Table 7). The number of males was greater than the number of females in this group. The lesions in this group were further divided into bone, salivary gland, epithelial and soft tissue

Table 6 Number and sex distribution in older Taiwanese patients with benign odontogenic tumours.

Benign odontogenic tumours	*Male*	*Female*	*% of the same lesion in all age groups*
Ameloblastoma	9	3	7.0
Odontogenic fibroma	2	2	9.5
Odontoma	2	0	1.1
Odontogenic myxoma	2	0	20.0
Cementoblastoma	1	1	18.2
Cemento-ossifying fibroma	1	1	8.3
Squamous odontogenic tumour	1	0	50.0
Total	18	7	

subgroups. Osteoma and pleomorphic adenoma were the most frequent lesions, respectively, in the bone and salivary gland subgroups. The highest number of lesions in this group was observed in the epithelial subgroup, which comprised about 90% of the lesions in this group. Three types of epithelial lesion (epithelial dysplasia, oral submucous fibrosis and verrucous hyperplasia) in this subgroup were overt oral potentially malignant disorders. In the soft tissue subgroup, fibrous hyperplasia and fibroma were the two most common lesions.

The third greatest number of cases ($n = 1096$) of all the OMF lesions in the older patients was non-odontogenic malignant tumours (Table 8). The number of males ($n = 879$) was much greater than the number of females ($n = 217$). Mesenchymal, hematologic, salivary gland and epithelial subgroups were identified according to the different anatomic locations; the frequencies of the first three subgroups were much lower as compared to the epithelial subgroup. Significantly, all the seven lesions in the epithelial subgroups were malignancies, which, additionally, constituted a relatively high proportion as compared, respectively, to each of the same lesions in all age groups. Squamous cell carcinoma was the most common lesion in both the epithelial subgroup (864/1049) and the whole group of non-odontogenic malignant tumours (864/1096). Adenoid cystic carcinoma and osteogenic sarcoma, as well as malignant schwannoma and non-Hodgkin's lymphoma, were the most common lesions, respectively, in the salivary gland, mesenchymal and hematologic subgroups.

Forty-three different kinds of lesion, a total number of 2459 lesions, which was the second greatest number of lesions of all the OMF lesions

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Table 7 Number and sex distribution in older Taiwanese patients with benign non-odontogenic tumour/tumour-like reactive lesions.

Benign non-odontogenic tumour/tumour-like reactive lesions	*Male*	*Female*	*% of the same lesion in all age groups*
Bone			
Osteoma	1	2	17.7
Chondroid choristoma	0	1	16.7
Synovial chondromatosis	0	1	100
Salivary gland			
Pleomorphic adenoma	4	6	14.7
Papillary cystic adenoma	1	2	27.8
Warthin's tumour	2	1	17.7
Benign lymphoepithelial lesion	1	0	100
Epithelial			
Hyperkeratosis	523	164	15.7
Epithelial dysplasia*	523	124	23.1
Epithelial hyperplasia	326	110	19.5
Oral submucous fibrosis*	264	78	17.5
Verrucous hyperplasia*	261	74	17.9
Papilloma	10	10	16.5
Soft tissue			
Fibrous hyperplasia	66	64	32.7
Fibroma	32	49	17.9
Hemangioma	15	23	30.2
Lipoma	9	8	41.5
Lymphangioma	5	2	25.9
Verruciform xanthoma	3	1	17.4
Myxofibroma	2	1	25.0
Peripheral giant cell granuloma	2	0	66.7
Keratoacanthoma	0	2	66.7
Peripheral odontogenic myxoma	1	1	50
Neuroma	1	1	18.2
Seborrhoeic keratosis	1	0	16.7
Solitary fibrous tumour	0	1	50.0
Oral focal mucinosis	1	0	10.0
Neurofibroma	1	0	6.3
Total	2055	726	

*Overt oral potentially malignant disorders.

in the older patients, were observed in the group of inflammatory/infective diseases (Table 9). The number of males (n = 1343) was higher than the number of females (n = 1116). The most common lesion was candidiasis (n = 686), followed by inflammation (n = 474), and non-specific ulcer (n = 310); these first three lesions comprised about 60% of this group. A small percentage (3.5%) of autoimmune diseases (lichen planus, pemphigus vulgaris and Sjögren's syndrome) was observed in this group.

Table 8 Number and sex distribution in older Taiwanese patients with malignant non-odontogenic tumours.

Malignant non-odontogenic tumours	*Male*	*Female*	*% of the same lesion in all age groups*
Mesenchymal			
Osteogenic sarcoma	2	1	27.3
Malignant schwannoma	3	0	60.0
Rhabdomyosarcoma	2	0	50.0
Hematologic			
Non-Hodgkin's lymphoma	2	3	35.7
Hodgkin's lymphoma	1	1	25.0
Multiple myeloma	0	1	11.1
Salivary gland			
Adenoid cystic carcinoma	10	5	48.4
Papillary cystic adenocarcinoma	6	2	53.3
Mucoepidermoid carcinoma	4	2	17.7
Acinic cell carcinoma	1	0	50.0
Epithelial			
Squamous cell carcinoma	701	163	15.5
Verrucous carcinoma	79	22	22.4
Carcinoma *in situ*	31	7	21.4
Metastatic carcinoma	27	9	31.3
Undifferentiated carcinoma	7	1	50.0
Spindle cell carcinoma	2	0	16.7
Melanoma	1	0	50.0
Total	879	217	

Equal numbers of male and female patients were observed in the group of other miscellaneous lesions (Table 10), with the most common lesion being exostosis (n = 51), followed by bone fragment (n = 17), tooth fragment (n = 16) and hematoma (n = 11).

Discussion

In this study, we analysed 6727 OMF lesions in an older Taiwanese population, which comprised approximately 17% of all the lesions. This result was lower than the report of Scott & Cheah[16] (20%), but slightly higher than the data of Muzyka *et al.*[17] (16%), Correa *et al.*[13] (13%), Kononen *et al.*[15] (12%) and Carvalho *et al.*[14] (10%). Squamous cell carcinoma was the most common OMF lesion in our cohort, which was similar to the studies of Correa *et al.*[13] and Carvalho *et al.*[14] conducted in Brazil but in contrast to the reports

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Table 9 Number and sex distribution in older Taiwanese patients with inflammatory/infective lesions.

Inflammatory/infective lesions	*Male*	*Female*	*% of the same lesion in all age groups*
Candidiasis	430	256	27.3
Inflammation	233	241	25.2
Non-specific ulcer	188	122	31.9
Osteomyelitis	48	85	44.2
Apical granuloma	63	69	13.8
Sequestrum	49	73	46.0
Granulation tissue	58	57	12.1
Pyogenic granuloma	47	45	17.0
Lichen planus*	23	56	15.3
Lymphadenitis	62	11	13.2
Mucocele	30	17	4.4
Sialadenitis	16	19	18.0
Scar tissue	27	8	19.6
Necrotic tissue	13	5	24.7
Mucositis	7	8	29.4
Osteoradionecrosis	11	2	23.2
Epulis fissuratum	5	3	2.4
Tuberculosis	4	3	43.8
Actinomycosis	3	3	30.0
Epulis granulomatosum	1	5	23.1
Osteitis	1	4	38.5
Sialolithiasis	3	2	14.3
Gingival hyperplasia	1	3	33.3
Pemphigus vulgaris*	3	1	16.7
Sjogren syndrome*	0	4	28.6
Foreign body granuloma	2	1	6.8
Periodontitis	2	1	11.5
Sinusitis	2	1	9.4
Glossitis	0	2	100.0
Amyloidosis	2	0	40.0
Gingivitis	1	1	10.5
Fibrosis	0	2	3.6
Thrombus	2	0	18.2
Pulpitis	1	1	100.0
Fistula	1	1	20.0
Histoplasmosis	0	1	100.0
Condensing osteitis	0	1	3.2
Periapical abscess	1	0	100.0
Polyp	1	0	16.7
Socket sclerosis	0	1	100.0
Caries	1	0	33.3
Necrotising sialometaplasia	1	0	9.1
Phlebolith with thrombosis	0	1	50.0
Total	1343	1116	

*Autoimmune diseases.

Table 10 Number and sex distribution in older Taiwanese patients with other miscellaneous lesions.

Other miscellaneous lesions	*Male*	*Female*	*% of the same lesion in all age groups*
Exostosis	22	29	18.6
Hematoma	5	6	30.6
Foreign body	4	4	18.2
Blood clot	4	1	83.3
Cemento-osseous dysplasia	0	5	100.0
Hypercementosis	3	1	28.6
Melanoplakia	1	2	18.8
Oral melanotic macule	1	1	10.0
Osteoporosis	2	0	100.0
Amalgam tatoo	0	1	25.0
Calcification	0	1	25.0
Epithelial atrophy	1	0	50.0
Fordyce granule	1	0	4.4
Nevus	1	0	4.2
Internal root resorption	1	0	33.3
Total	46	51	

of Kononen *et al.*[15] conducted in the UK and Muzyka *et al.*[17] in the US, in which radicular cyst and fibroma were, respectively, the most common lesions. This disparity may be due to the different geographic distributions of betel quid chewing, which is a high risk factor for oral squamous cell carcinoma and is highly prevalent in Taiwan[18].

Most OMF lesions of the older patients in the present study were distributed in the group of tumour/tumour-like reactive lesions (58.2%), followed by inflammatory/reactive lesions (36.4%); this result was in contrast to the studies of Muzyka *et al.*[17] and Correa *et al.*[13], which showed that inflammatory lesion was the most common lesion, at 54.2 and 55.2%, respectively. The incidence of inflammatory lesions in our study was lower as compared to the reports of Correa *et al.*[13] (52.2%) and Muzyka *et al.*[17] (54.2%) but higher than the data of Carvalho *et al.*[14] (22.2%) and Scott & Cheah[16] (15.5%).

Radicular cyst accounted for 12.6% of all the lesions in the present study, which was much higher than the data of Santos *et al.* (4.9%)[19], reported in a Brazilian population of all ages. Additionally, radicular cyst was the most common lesion in the odontogenic cyst group (80%) in this study and was predominantly greater than the other lesions within this group; this result was similar to the data of other studies[15,20,21]. Dentigerous cyst was the second most common lesion in this group (8%), which is much lower than the result of Manikam *et al.*[22] (20.3%). Kononen *et al.*[15] also reported the lowest frequency of dentigerous cyst amongst the nine most common

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single diagnoses for biopsied OMF lesions in the older patients in their report. On the other hand, epidermoid cyst was the most common lesion in the non-odontogenic cyst/pseudocyst group; however, only seven cases with five different disease entities were documented. The low number of diseases in this group in the present study was compatible with other studies[14,16,17]. Ameloblastoma was the most common lesion in the odontogenic tumour group in our cohort, but there were only twelve cases. The relatively low number of ameloblastoma cases in the older population has also been noted in other previous reports[23–26].

Oral potentially malignant disorders comprised about 20% of all the OMF lesions in our cohort, which was lower than the report of Tomas *et al.*[27] in Papua (26%); however, our data were higher as compared to two reports from Brazil (7.96 and 7.49%, respectively)[13,14] as well as a report from the US (7.08%)[17]. This disparity may again, at least in part, be due to the high prevalence of betel quid chewing in our country[18]. The ratio of males to females for oral potentially malignant disorders in our cohort was 3.8:1, which was the same as that reported by Tomas *et al.*[27] (3.8:1). The three overt oral potentially malignant disorders in the present study were epithelial dysplasia, oral submucous fibrosis and verrucous hyperplasia, which was compatible with the report of Muzyka *et al.*[17].

The number of salivary gland diseases was relatively low in our cohort, which was compatible with the report of Muzyka *et al.*[17]. The most common lesion in the salivary gland group in our cohort was pleomorphic adenoma (58.8%), which was consistent with other studies[28–30]. Moreover, most of these tumours were located in the palate in our cohort, which was also compatible with other reports[28–31]. Warthin's tumour was reported to be the second most common lesion, with a relatively high percentage of the total number of salivary gland lesions, in other previous studies[28–30]. In contrast to these previous studies[28–30], only three cases were found in the present cohort.

Fibrous hyperplasia and fibroma were the two most common lesions in the soft tissue subgroup (1.9 and 1.2%). This finding, however, was in contrast to the report of Muzyka *et al.* (15.6%)[17]. This may be due to differences in oral habits between American and Taiwanese subjects.

Within the non-odontogenic (malignant) tumour group, the highest number of subjects ($n = 1049$) was distributed in the epithelial subgroup. The mean age of the older with malignant lesions was 70.8 years, which is compatible with the North American population[32]. The ratio of males to females in the non-odontogenic malignant tumour group in the present study was 4:1, which was higher than the data of Ferlay *et al.*[33]. Squamous cell carcinoma ($n = 864$; 12.8%) was the most common lesion in this subgroup, followed by verrucous carcinoma ($n = 101$; 1.5%). This finding was greater than the report of Muzyka *et al.*[17] ($n = 453$; 5.5%). On the other hand, adenoid cystic carcinoma was the most common lesion in the salivary gland subgroup ($n = 15$) in the present cohort, which was compatible with Correa *et al.*[13] but in contrast to the studies of Zohreh *et al.*[28,29] and Wang *et al.*[28,29], who both reported a relatively higher number of adenoid cystic carcinomas compared with other types of malignant salivary gland lesions. Moreover, most of the adenoid cystic carcinomas in our study were located in the mouth floor and tongue, which was different to other studies[28–30] in which most of these lesions were located in the submandibular gland and palate. Furthermore, the ratio of benign to malignant salivary gland lesions was 1:1.7 in our study, which was in contrast to other studies[27–29].

Candidiasis was the most common lesion in the inflammatory/infective group, constituting 10.2% of all the OMF lesions in the older in our study, which was much greater than the report of Correa *et al.*[13] (0.8%). Inflammation was the second most common disease (7.0%); this result was lower than the report of Carvalho *et al.*[14] (9.2%). Within this group, lichen planus, Sjogren syndrome and pemphigus vulgaris were the autoimmune diseases (1.3%), in which lichen planus was the most common lesion ($n = 79$; 1.2%), which was similar to the result of Correa *et al.*[13] (1.7%); however, it was much lower than the result of Scott & Cheah[16] (8.4%).

Conclusion

Our study demonstrated similar trends to previous reports from other countries. However, some detailed information was different, perhaps due to the different criteria and different time ranges and geographic distributions. Worthy of note, squamous cell carcinoma was the most common lesion, and there was a high prevalence of oral potentially malignant disorders, indicating that detection of these lesions in the older population is essential.

Conflict of interests

The authors have no conflict of interests to declare.

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