Journal of Dental Sciences (2014) 9, 69—77

Available online at www.sciencedirect.com

SciVerse ScienceDirect

journal homepage: www.e-jds.com

ORIGINAL ARTICLE

Oral mucosal lesions and developmental anomalies in dental patients of a teaching hospital in Northern Taiwan

Meng-Ling Chiang [a,b], Yu-Jia Hsieh [b,c], Yu-Lun Tseng [d], Jr-Rung Lin [e], Chun-Pin Chiang [f,g*]

[a] Department of Pediatric Dentistry, Chang Gung Memorial Hospital, Taipei, Taiwan
[b] College of Medicine, Chang Gung University, Taoyuan, Taiwan
[c] Department of Craniofacial Orthodontics, Chang Gung Memorial Hospital, Taoyuan, Taiwan
[d] Department of Psychiatry, College of Medicine, China Medical University, Taichung, Taiwan
[e] Clinical Informatics and Medical Statistics Research Center, Chang Gung University, Taoyuan, Taiwan
[f] Graduate Institute of Oral Biology, School of Dentistry, National Taiwan University, Taipei, Taiwan
[g] Department of Dentistry, National Taiwan University Hospital, College of Medicine, National Taiwan University, Taipei, Taiwan

Received 1 June 2013; Final revision received 10 June 2013
Available online 27 July 2013

KEYWORDS
dental patient;
developmental anomaly;
northern Taiwan;
oral mucosal lesion;
prevalence;
type

Abstract *Background/purpose:* Oral mucosal lesions and developmental anomalies are frequently observed in dental practice. The purpose of this study was to evaluate the prevalence of oral mucosal lesions and developmental anomalies in dental patients in a teaching hospital in northern Taiwan.
Materials and methods: The study group comprised 2050 consecutive dental patients. From January 2003 to December 2007, the patients received oral examination and treatment in the dental department of the Chang Gung Memorial Hospital (Taipei, Taiwan).
Results: Only 7.17% of dental patients had no oral mucosal lesions or developmental anomalies. Twenty-three different types of oral mucosal lesions or developmental anomalies were diagnosed. The most common lesion was Fordyce granules (82.8%), followed by buccal exostosis (34.1%), torus mandibularis (24.2%), torus palatinus (21.1%), lingual varices (16.2%), and recurrent aphthous ulcerations (4.3%). Fordyce granules, lingual varices, and buccal exostosis were the three most common oral developmental anomalies in elderly patients. Fordyce granules, buccal exostosis, torus mandibularis, lingual varices, and oral submucous fibrosis were more prevalent in men than in women. Fordyce granules occurred more commonly in adults than in children and were more commonly present in the labial and buccal mucosae than

* Corresponding author. Department of Dentistry, National Taiwan University Hospital, Taipei 10048, Taiwan.
E-mail address: cpchiang@ntu.edu.tw (C.-P. Chiang).

http://dx.doi.org/10.1016/j.jds.2013.06.004

in any other oral mucosal sites. The anterior region of the jaws frequently contained buccal exostoses. Torus palatinus occurred more frequently in female patients than in male patients. Recurrent aphthous ulcerations were more common in patients under 18 years old.
Conclusion: This study provides important data about the types and prevalence of oral mucosal lesions and developmental anomalies in dental patients in a teaching hospital in northern Taiwan.

Introduction

The presence of oral mucosal lesions and developmental anomalies are relatively common reasons that patients visit dental clinics. Diagnosis of a wide variety of oral mucosal lesions and developmental anomalies is an essential part of a daily dental practice. It is important for every dentist to have a knowledge of the type and prevalence of oral mucosal lesions and developmental anomalies. Only four reports of massive oral mucosa screening have been published.[1–4] Various studies have also reported the prevalence of oral mucosal lesions and developmental anomalies in a select population or group of patients in Brazil,[5] Turkey,[6] Saudi Arabia,[7] Slovenia,[8] south India,[9] Malaysia,[10] Thailand,[10] Jordan,[11] and Cambodia.[12]

To date, there has been no studies on the type and prevalence of oral mucosal lesions and developmental anomalies in dental patients residing in northern Taiwan. The aim of this study was to evaluate the type and prevalence of oral mucosal lesions and developmental anomalies in dental patients in a teaching hospital in northern Taiwan.

Materials and methods

The study group comprised 2050 consecutive dental patients who received oral examinations and treatment in the dental department of the Chang Gung Memorial Hospital (Taipei, Taiwan) from January 2003 to December 2007. To record the clinical characteristics of each oral lesion or developmental anomaly of interest, history-taking and a thorough oral examination (which included a radiographic examination of each patient) were performed by a certified oral pathologist in the standard manner.

Twenty-three types of oral mucosal lesions and developmental anomalies were recorded on a special sheet developed for the survey. Recurrent aphthous ulcerations were recorded only if they were present on the day the individual was examined. Finger palpation of the oral mucosal lesions and developmental anomalies such as exostoses or suspected malignancies was performed routinely to confirm the diagnosis. An oral biopsy was obtained for lesions that were suspected of being malignant, if necessary. The diagnosis of oral mucosal lesions and developmental anomalies was based on World Health Organization (WHO) guidelines[13] and on the characteristic clinical features of oral mucosal lesions and developmental anomalies described in the *Color Atlas of Common Oral Diseases*.[14] The participants were further referred to the appropriate dental department in the Chang Gung Memorial Hospital for treatment in accordance with their requests or needs.

Statistical analyses were performed with SPSS version 15.0 software (SPSS, Chicago, IL, USA). The Chi-square test and Fisher's exact tests were used to analyze the association between variables. For all analyses, $P < 0.05$ was considered statistically significant.

Results

The study group included 912 (44.5%) male dental patients and 1138 (55.5%) female dental patients. The mean age of patients was 45.7 $\pm$ 20.2 years (age range, 4—91 years). Of the 2050 patients, 81 patients were younger than 18 years old; 1006 patients were between 18 and 44 years; 486 patients were between 45 and 64 years old; 477 patients were 65 years or older. Table 1 summarizes the distribution of oral mucosal lesions and developmental anomalies, according to the age and gender of the patients. Only 7.17% of the patients had no oral mucosal lesions or developmental anomalies. Twenty-three different oral mucosal lesions or developmental anomalies were diagnosed, the most common of which was Fordyce granules (82.8%; Fig. 1A), followed in descending order by buccal exostosis (34.1%; Fig. 1B), torus mandibularis (24.2%; Fig. 1C), torus palatinus (21.1%; Fig. 1D), lingual varices (16.2%; Fig. 1E), and recurrent aphthous ulcerations (4.3%; Fig. 1F—H).

Fordyce granules

Fordyce granules were more common in adults (83.6%; 1647 of 1969 adults) than in children (63.0%; 51 of 81 children) ($P < 0.001$) (Table 1). Most (56.8%) Fordyce granules occurred at the buccal mucosae and the labial mucosae (Table 2). The labial mucosa was the more common site for Fordyce granules. For the labial mucosal region, the frequency of Fordyce granules on the upper labial mucosa, lower labial mucosa, and buccal mucosa near the mouth angle were nearly equal in adults. However, the buccal mucosa near mouth angle was the most common site for Fordyce granules in children under 18 years old ($P < 0.05$). For the buccal mucosal region, bilateral involvement was more common (at 74.3%, representing 838 of 1128 patients) than unilateral involvement ($P < 0.05$). In 0.4% of cases, Fordyce granules were present in other locations (e.g., the retromolar area or the anterior tonsillar pillar), and when present in these areas, Fordyce granules were also present in the buccal or the labial mucosa. In adults, there was a higher frequency of unilateral involvement (i.e., buccal or labial mucosa only or unilateral buccal mucosa) in females than in males, ($P < 0.05$).

Table 1 The distribution of oral mucosal lesions and developmental anomalies, according to the age and sex of dental patients.

	Sex	<18 years *n* (%)	18–44 years *n* (%)	45–64 years *n* (%)	≥65 years *n* (%)	Subtotal *n* (%)	Total *n* (%)	P	
								Age	Sex
Fordyce granules	F	29 (64.4)	467 (77.8)	217 (94.2)	169 (73.2)	882 (77.5)	1698 (82.8)	<0.001[a]	<0.001[a]
	M	22 (61.1)	366 (90.1)	206 (92.0)	222 (90.2)	816 (89.5)			
Exostosis									
Buccal exostosis	F	3 (6.7)	188 (31.3)	97 (37.0)	58 (25.1)	346 (30.4)	699 (34.1)	<0.001[a]	<0.001[a]
	M	7 (19.4)	172 (42.4)	88 (39.3)	86 (35.0)	353 (38.7)			
Mandible	F	3 (6.7)	161 (26.8)	81 (30.9)	50 (21.6)	295 (26.0)	569 (81.4)[†]	<0.001[a]	0.04[a]
	M	4 (11.1)	141 (34.7)	65 (29.0)	64 (26.0)	274 (30.0)			
Maxilla	F	1 (2.2)	114 (19.0)	55 (21.0)	29 (12.6)	199 (17.5)	447 (64.0)[†]	0.001[a]	<0.001[a]
	M	5 (13.9)	118 (29.1)	66 (29.5)	59 (24.0)	248 (27.2)			
Torus mandibularis	F	5 (11.1)	173 (28.8)	51 (19.5)	29 (12.6)	258 (22.7)	495 (24.2)	<0.001[a]	0.08[a]
	M	4 (11.1)	142 (35.0)	61 (27.2)	30 (12.2)	237 (26.0)			
Torus palatinus	F	11 (24.4)	202 (33.7)	75 (28.6)	42 (18.2)	330 (29.0)	433 (21.1)	<0.001[a]	<0.001[a]
	M	4 (11.1)	58 (14.3)	30 (13.4)	11 (4.5)	103 (11.3)			
Tongue									
Lingual varices	F	1 (2.2)	18 (3.0)	43 (16.4)	99 (42.9)	161 (14.1)	333 (16.2)	<0.001[a]	0.004[a]
	M	0 (0)	14 (3.4)	28 (12.1)	130 (52.8)	172 (18.9)			
Geographic tongue	F	2 (4.4)	9 (1.5)	1 (0.4)	1 (0.4)	13 (1.1)	28 (1.4)	0.096[a]	0.33[a]
	M	1 (2.8)	11 (2.7)	2 (0.9)	1 (0.4)	15 (1.6)			
Fissured tongue	F	1 (2.2)	6 (1.0)	2 (0.8)	3 (1.3)	12 (1.1)	26 (1.3)	0.012[a]	0.33[a]
	M	0 (0)	1 (0.2)	3 (1.3)	10 (4.1)	14 (1.5)			
Ankyloglossia	F	1 (2.2)	2 (0.3)	0 (0)	1 (0.4)	4 (0.4)	11 (0.5)	0.409[b]	0.23[b]
	M	0 (0)	5 (1.2)	2 (0.9)	0 (0)	7 (0.8)			
Cleft tongue	F	0 (0)	2 (0.3)	1 (0.4)	1 (0.4)	4 (0.4)	6 (0.3)	0.811[b]	0.70[b]
	M	0 (0)	1 (0.2)	0 (0)	1 (0.4)	2 (0.2)			
Median rhomboid glossitis	F	0 (0)	0 (0)	1 (0.4)	0 (0)	1 (0.1)	5 (0.2)	0.307[b]	0.18[b]
	M	0 (0)	1 (0.2)	2 (0.9)	1 (0.4)	4 (0.4)			
Atrophic tongue	F	0 (0)	1 (0.2)	2 (0.8)	1 (0.4)	4 (0.4)	5 (0.2)	0.307[b]	0.39[b]
	M	0 (0)	0 (0)	1 (0.4)	0 (0)	1 (0.1)			
Recurrent aphthous ulcerations	F	6 (13.3)	32 (5.3)	5 (1.9)	4 (1.7)	47 (4.1)	84 (4.3)	<0.001[a]	0.89[a]
	M	3 (8.3)	23 (5.7)	10 (4.5)	1 (0.4)	37 (4.0)			
Burning mouth syndrome	F	0 (0)	10 (1.7)	11 (4.2)	6 (2.6)	27 (2.4)	40 (2.0)	0.030	0.12[a]
	M	0 (0)	6 (1.5)	6 (2.7)	1 (0.4)	13 (1.4)			
Lichen planus	F	0 (0)	1 (0.2)	7 (2.7)	3 (1.3)	11 (1.0)	23 (1.1)	<0.001[a]	0.46[a]
	M	0 (0)	4 (1.0)	8 (3.6)	0 (0)	12 (1.3)			
Lips and palate									
Commissural pit	F	0 (0)	4 (0.7)	2 (0.8)	1 (0.4)	7 (0.6)	9 (0.4)	0.462[b]	0.31[b]
	M	1 (2.8)	1 (0.2)	0 (0)	0 (0)	2 (0.2)			
Congenital lower lip pit	F	0 (0)	0 (0)	1 (0.4)	0 (0)	1 (0.1)	2 (0.1)	0.759[b]	1.00[b]
	M	0 (0)	1 (0.2)	0 (0)	0 (0)	1 (0.1)			
Cleft lip/palate	F	1 (2.2)	3 (0.5)	0 (0)	1 (0.4)	5 (0.4)	9 (0.4)	0.023[b]	1.00[b]
	M	1 (2.8)	3 (0.7)	0 (0)	0 (0)	4 (0.4)			
Double upper lip	F	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	—	—
	M	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)			
Oral cancer screen									
Oral submucous fibrosis	F	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	8 (0.4)		0.004[a]
	M	0 (0)	3 (0.7)	5 (2.2)	0 (0)	8 (0.9)			
Frictional hyperkeratosis	F	0 (0)	1 (0.2)	1 (0.4)	2 (0.9)	4 (0.4)	7 (0.3)	0.649[b]	1.00[b]
	M	0 (0)	2 (0.5)	0 (0)	1 (0.4)	3 (0.3)			
Leukoplakia	F	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (0.2)	0.736[b]	0.09[b]
	M	0 (0)	2 (0.5)	1 (0.4)	0 (0)	3 (0.3)			
Erythroplakia	F	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.1)	0.272[b]	0.45[b]
	M	0 (0)	0 (0)	0 (0)	1 (0.4)	1 (0.1)			
Erythroleukoplakia	F	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	—	—
	M	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)			

(*continued on next page*)

Table 1 (*continued*)

	Sex	<18 years *n* (%)	18–44 years *n* (%)	45–64 years *n* (%)	≥65 years *n* (%)	Subtotal *n* (%)	Total *n* (%)	P	
								Age	Sex
Total	F	45	600	262	231	1138	2050		
	M	36	406	224	246	912			

F = female; M = male.
The data are presented as the number of cases (%).
[a] Based on the Chi-square test.
[b] Based on Fisher's exact test.
[†] Percentage among the lesions.

Exostosis

In the dental patients, the prevalence of buccal exostosis was 34.1%. Of 699 cases of buccal exostosis, 81.4% were on the maxillary alveolus and 64% were on the mandibular alveolus (Table 1). Buccal exostoses were more prevalent in males than in females ($P < 0.001$) (Table 1). Buccal exostoses of both arches were frequently observed in the anterior region (Table 3) and had a posterior declined distribution from first premolar. If buccal exostoses occurred bilaterally, most lesions appeared to cross the midline (Table 3). Buccal exostosis was more commonly symmetric than asymmetric (Table 3). Unilateral buccal exostosis usually involved less than three teeth (Table 3).

Torus mandibularis and torus palatinus were observed in 24.2% and 21.1% of dental patients, respectively. Both types of tori were significantly associated with the age of patients ($P < 0.001$) (Table 1). Torus palatinus occurred more frequently in female patients than in male patients. The mean age of onset was 41.4 years for torus palatinus and 40.2 years for torus mandibularis. The most common age for the onset of either torus mandibularis or torus palatinus ranged from 21 to 30 years of age. In female patients under 18 years of age, torus palatinus was more common than buccal exostosis and torus mandibularis, whereas in adult female patients over 45 years of age, buccal exostosis was more frequent than torus palatinus (Table 1).

Tongue lesions

Three hundred and ninety-four (19.2%) dental patients were diagnosed as having at least one type of tongue lesion at the time of oral examination. Of these patients, 16 (4.1%) had two or more tongue lesions present simultaneously.

Lingual varicosity was the most common tongue lesion in this study and the second most common oral mucosal lesion in elderly patients (Table 1). The mean age of patients with lingual varices was 67.4 years (range, 17–91 years). Approximately 60% of patients with lingual varices were older than 70 years.

Geographic tongue was observed in 1.4% of dental patients and the mean age of the patients was 33.3 years. A fissured tongue was present in 1.3% of dental patients and the mean age of these patients was 57.4 years. Six patients had both a fissured tongue and a geographic tongue. Other relatively rare tongue lesions included ankyloglossia (0.5%), cleft tongue (0.3%), median rhomboid glossitis (0.2%), and atrophic tongue (0.2%) (Table 1).

Recurrent aphthous ulcerations

Recurrent aphthous ulcerations (RAU) was present in 4.3% of dental patients and was more commonly encountered in patients under 18 years old ($P < 0.001$) (Table 1). Minor type RAU was the most frequent ulceration (82%; Fig. 1F), followed by major type RAU (12%; Fig. 1G) and herpetiform type RAU (6%; Fig. 1H) (Table 4). For minor RAU, the frequency decreased as a patient's age increased ($P < 0.05$). For major RAU, the frequency increased as the age increased ($P < 0.05$). In this study, herpetiform RAU was observed only in patients 18 to 64 years old, but more frequently in the patients in this age range who were relatively older (Table 4).

Burning mouth syndrome

Burning mouth syndrome (BMS) was present in 2.0% of the dental patients. The mean age of patients was 52.2 years for women and 45.8 years for men. Only in adults was BMS observed. There was a significant difference in prevalence between the different age groups ($P = 0.03$) (Table 1). Sixty percent of BMS patients were 45 years or older. Burning tongue, xerostomia, and dry eyes were the three most commonly associated symptoms (Table 5). Diabetes mellitus, hypothyroidism, and rheumatoid arthritis were the three most frequent systemic diseases associated with BMS (Table 5).

Oral lichen planus

Oral lichen planus (OLP) was observed 1.1% of dental patients and only in adults (Table 1). There were significant differences in the frequency of OLP in the different age groups ($P < 0.001$). Reticular and erosive OLP were the two most common types in our patients (Table 6).

The lips and palate

Commissural pits were observed in nine (0.4%) patients; the pits were bilateral in four patients and unilateral in five

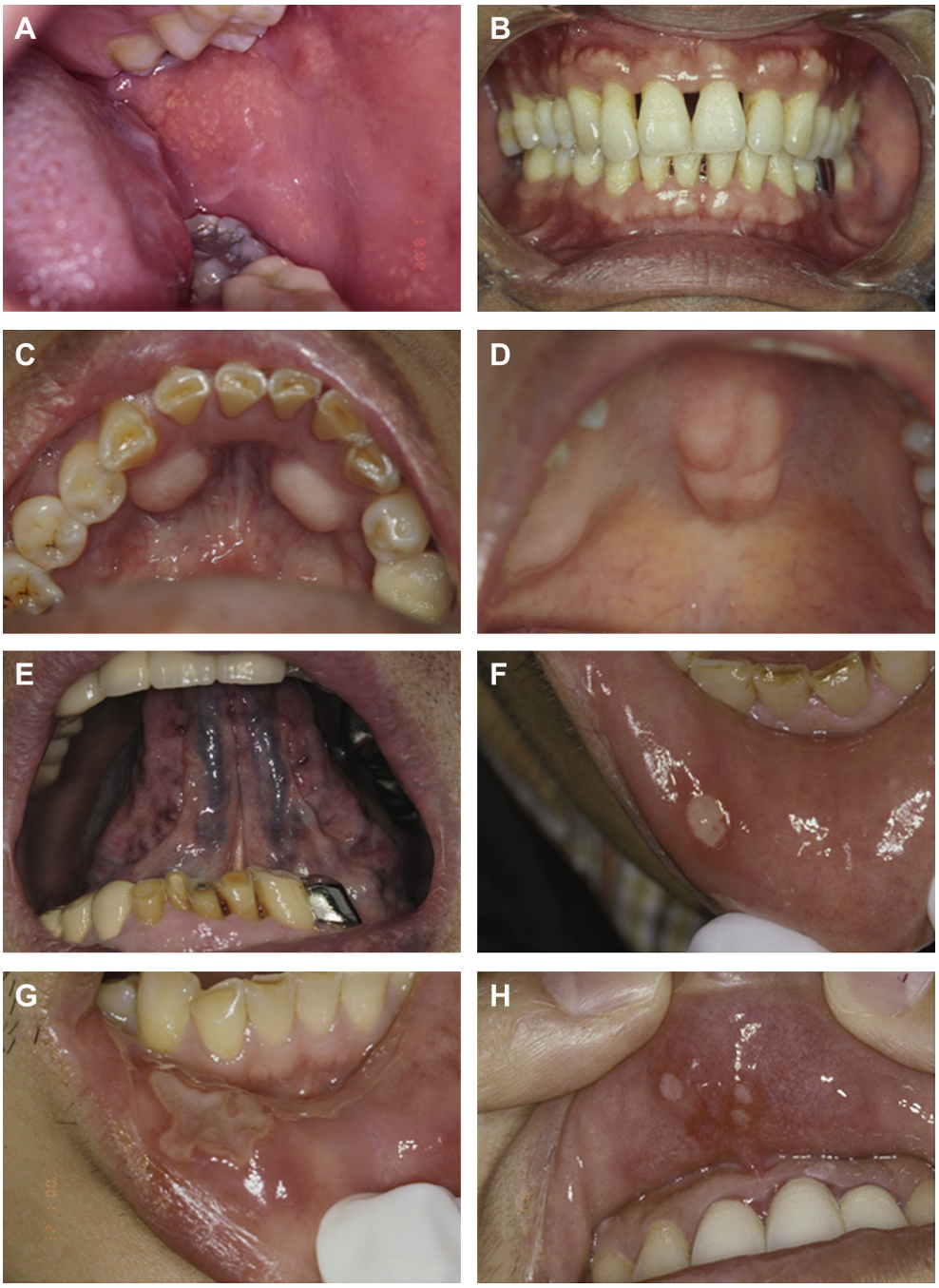

Figure 1 Clinical photographs of oral mucosal lesions and developmental anomalies. (A) Fordyce granules at the left posterior buccal mucosa. (B) Symmetric exostoses at the labial and buccal cortical plate of alveolar bone. (C) Torus mandibularis at the lingual side of bilateral mandibular canine and first premolar areas. (D) Torus palatinus at the middle portion of the hard palate. (E) Lingual varices at the ventral surface of the tongue. (F) A minor aphthous ulcer at the right lower labial mucosa. (G) A major aphthous ulcer at the right lower labial mucosa. (H) Herpetiform aphthous ulcers at the middle area of the upper labial mucosa.

patients, and mostly on the left side. Only two (0.1%) patients had congenital lower lip pits, which were bilateral in both patients. No patient had a double upper lip in this study. Cleft lip and/or cleft palate was present in nine (0.4%) dental patients. Three of these patients had only cleft lips and six patients simultaneously had a cleft lip and cleft palate.

Oral cancer screen

Oral submucous fibrosis (OSF) was present in eight (0.4%) dental patients, oral leukoplakia in three (0.2%) dental patients, and oral erythroplakia in one (0.1%) dental patient; all of these patients were males. Frictional hyperkeratosis in seven (0.3%) patients occurred mostly

Table 2 Distribution of Fordyce granules according to the age and sex of dental patients ($n = 1698$).

	<18 years		18–44 years		45–64 years		≥65 years		Total	
	Female ($n = 29$)	Male ($n = 22$)	Female ($n = 467$)	Male ($n = 366$)	Female ($n = 218$)	Male ($n = 206$)	Female ($n = 169$)	Male ($n = 222$)	No.	%
Buccal mucosa and labial mucosa	10 (34.5)	10 (45.5)	208 (44.5)	261 (71.3)	108 (49.5)	148 (71.8)	80 (47.3)	143 (64.4)	965	56.8
Labial mucosa only	6 (20.7)	6 (27.3)	201 (43.0)	81 (22.1)	82 (37.6)	45 (21.8)	74 (43.8)	65 (29.3)	567	33.4
Labial mucosa region										
Upper lip	9 (31.0)	7 (31.8)	299 (64.0)	284 (77.6)	149 (68.3)	183 (88.8)	125 (74.0)	186 (83.8)	1242	
Lower lip	5 (17.2)	2 (9.1)	201 (43.0)	238 (65.0)	131 (60.1)	164 (79.6)	105 (62.1)	164 (73.9)	1010	
Near mouth angle	19 (65.5)	15 (68.2)	324 (69.4)	299 (81.7)	125 (57.3)	148 (71.8)	95 (56.2)	137 (61.7)	1162	
Buccal mucosa only	7 (24.1)	6 (27.3)	56 (12.0)	24 (6.6)	27 (12.4)	11 (5.3)	15 (8.9)	14 (6.3)	159	9.4
Buccal mucosa									1128	
Right side	15 (51.7)	11 (50.0)	180 (38.5)	255 (69.7)	93 (42.7)	142 (68.9)	71 (42.0)	133 (60.0)	900	
Left side	13 (44.8)	15 (68.2)	256 (54.8)	269 (73.5)	125 (57.3)	146 (70.9)	90 (53.3)	152 (68.5)	1066	
Only one side	6 (20.7)	6 (27.3)	92 (19.7)	46 (12.6)	52 (23.9)	30 (14.6)	29 (17.2)	29 (13.1)	290	
Both sides	11 (37.9)	10 (45.5)	172 (36.8)	239 (65.3)	83 (38.1)	129 (62.6)	66 (39.1)	128 (57.7)	838	
Other mucosal sites	1 (3.4)	0	2 (0.4)	0	0	2 (1.0)	2 (1.2)	0	7	0.4

in the buccal mucosa, and the lesion was associated with the irritation of buccal mucosa by the wisdom teeth.

Oral submucous fibrosis was present on the buccal mucosa in eight patients, the labial mucosa in five patients, the soft palate in four patients, the retromolar area in four patients, and the floor of mouth in two patients. Multiple sites were involved in most OSF patients; only two patients had single site involvement (e.g., the buccal mucosa). The accompanying symptoms of OSF were xerostomia in five patients, intolerance to spices in three patients, ulcers or vesicles in two patients, burning sensation in two patients, hypogeusia in two patients, tongue depapillation in one patient, and throat pain in one patient. All eight OSF patients had a betel quid chewing habit.

Table 3 Frequency of buccal exostosis at the maxilla and the mandible in dental patients.

	Maxilla ($n = 447$)		Mandible ($n = 569$)	
	No. of cases	Percent	No. of cases	Percent
Bilateral	347	77.6	527	92.6
Cross midline	241	69.5[a]	489	92.8[a]
Symmetric	234		467	
Asymmetric	7		22	
Uncross midline	106	30.5[a]	38	7.2[a]
Symmetric	80		29	
Asymmetric	26		9	
Unilateral	100	22.4	42	7.4
<3 teeth	69	69.0[a]	37	88.1[a]
3–5 teeth	24	24.0[a]	5	11.9[a]
>5 teeth	7	7.0[a]	0	
Anterior teeth	425	95.0	557	97.9
Posterior teeth	119	26.6	61	10.7

[a] Percentage among the subgroups (i.e., cross midline, uncross midline, and unilateral).

Discussion

There is a high prevalence (82.8%) of Fordyce granules in dental patients residing in northern Taiwan. This result was similar to the prevalence in a Swedish population (82.8%)[1]; lower than the prevalence in adult Israeli Jews (94.9%)[15]; and much higher than the prevalence in Thai (57.7%) and Malaysian (61.8%) dental patients[10] or in the Jordanian population (49%),[16] the Slovenian population (49.7%),[8] and the Turkish population (1.3%).[6] These reports demonstrate wide variability in the prevalence of Fordyce granules. The discrepancy may be attributable to racial differences. Fordyce granules in our dental patients had a male predilection ($P < 0.001$). This tendency also occurred in the Swedish population,[1] the Slovenian population,[8] Thai and Malaysian dental patients,[10] and the aging German population.[17] However, our finding was in contrast to the result in the Saudi population.[7] In the current study, the prevalence of Fordyce granules was much higher in adults than in children and adolescents ($P < 0.001$); this finding was in accordance with the results of a previous study in Turkey.[6] This is probably because of the fact that the sebaceous glands and hair system do not reach maximal development until puberty.[18] For the children in this study, the mucosa near the mouth angle was the most common site for Fordyce granules ($P < 0.05$). However, it has been reported that large numbers of Fordyce granules in the buccal and labial mucosae sometimes may occur in children before puberty.[18]

Only three studies report the prevalence of buccal exostosis.[2,19,20] The prevalence of buccal exostosis in our dental patients (34.1%) was much higher than the prevalence in American people (0.09%),[2] Thai people (3.5%),[20] and the Jordanian population (the mandible, 7.1%; the maxilla, 10%).[19] All reports, except ours, found that the prevalence of buccal exostosis was higher at the maxilla than at the mandible.[2,19,20] In our dental patients, buccal exostoses were significantly more common in men than in women, which was in accordance with a report by

Table 4 The frequency of recurrent aphthous ulcerations, according to the lesion type and age of dental patients.

Type	No. of cases (%)				
	<18 years	18–44 years	45–64 years	≥65 years	Total
Minor, no. (%)	8 (89)	47 (85)	11 (74)	3 (60)	69 (82)
Major, no. (%)	1 (11)	5 (9)	2 (13)	2 (40)	10 (12)
Herpetiform, no. (%)	0	3 (6)	2 (13)	0	5 (6)
Total (no.)	9	55	15	5	84

Jainkittivong and Langlais.[20] In this study, we also analyzed the distribution and frequency of the buccal exostosis at the maxilla and at the mandible (Table 3).

We found that the incidence of either torus mandibularis or torus palatinus reached its peak before the age of 30. However, most previous studies have found that the peak age for both types of tori is between 30 and 50 years.[21] A previous study[22] reports that the onset of torus palatinus reaches its peak between the age of 11 and 20, and another study reports that its prevalence is highest until the age of 65 years.[23] However, the onset of torus mandibularis often reaches its peak until the sixth decade of life.[22,23] This current study showed a female predominance for torus palatinus. This result was in accordance with findings from other studies.[18,21] It may be that torus palatinus has a dominant inheritance linked to the X chromosome.[21]

Lingual varices were found in 16.2% of dental patients; this prevalence was similar to the prevalence in the Slovenian population (16.2%).[8] It was greater than the prevalence in Hong Kong Chinese 65- to 74-year-old adults (over 7%)[24]; the Turkish population (4.1%)[6]; home-living elderly Finnish adults (4%)[25]; institutionalized elderly South African adults (3.6%)[26]; the Saudi population (0.39%),[7] and the Brazilian population younger than 45 years old (0.2%).[5] However, the 16.2% prevalence in our study was lower than the prevalence in Brazilian diabetic patients (36.6%),[27] in a population over 60 years old in Edinburgh, Scotland (68.2%),[28] Thai population older than 60 years old (59.6%),[29] the adults in 65-year old Slovenian adults (35.7%),[8] and 75-year old Slovenian adults (57.3%).[8]

In the present study, lingual varices were more common in patients of the older age groups; this trend was similarly observed in previous studies.[6,8,29,30] In addition, we found that lingual varices were more prevalent in men than in women; this finding was in accordance with a Slovenian report[8] and in a report in an elderly Chinese population.[30] These results indicate that the prevalence of lingual varices may be mainly influenced by a person's race, age, and gender.

Geographic tongue was diagnosed in 1.4% of dental patients in northern Taiwan. The reported prevalence rates of geographic tongue varies from 0.1% to 14.4%, and most studies report the condition in about 1–2% of the subjects examined.[31] Fissured tongue was more prevalent in elderly people older than 65 years than in subjects younger than 65 years ($P = 0.012$) in our study. A similar finding was observed in Slovenian dental patients[8] and in a Turkish population.[6]

In this study, only RAU detected on the day of examination was included. Different methodologies for evaluating the prevalence of RAU have been used, thereby resulting in various findings.[31,32] Clinical studies have shown that RAU appears to be a disease with an onset in childhood or youth,[33] which is consistent with the results of the current study.

The age, sex, and urban or rural distribution of the sample are confounding factors for the prevalence of BMS in different populations. Burning mouth syndrome was detected in 2.0% of our dental patients, which was lower than 3.7% prevalence in a Swedish population,[34] but it higher than the 0.4% prevalence in a Turkish population.[6] In the current study, BMS was associated with increasing age in male and female patients until the age of 65 years. This result was consistent with the findings of a Sweden population.[34] The mean age of affected men was lower than that of affected women in our patients, which was inconsistent with the age reported in a previous study.[35] Seventy percent of our BMS patients complained of xerostomia, which was similar to the report in previous studies.[34,35]

The mean age of our 23 OLP patients was 52.5 years (age range, 26–85 years), which was similar to the age in our previous report.[36] Reticular OLP and erosive OLP were

Table 5 The frequency of symptoms or related systemic disease in dental patients with burning mouth syndrome.

Burning mouth syndrome ($n = 40$)	No. of cases	Percent
Burning tongue	36	90
Xerostomia	28	70
Dry eye	25	63
Diabetes mellitus	10	25
Hypothyroidism	7	18
Rheumatoid arthritis	6	15
Oral candidiasis	1	3
Sjogren's syndrome	1	3
Anemia (folic acid deficiency)	1	3

Table 6 The frequency of different types of oral lichen planus in dental patients.

Lichen planus ($n = 23$)	No. of cases	Percent
Reticular	20	87
Erosive	13	57
Plaque	2	9
Papular	2	9
Atrophic	1	4
Desquamative gingivitis	1	4

commonly types present, which was also in accordance with the finding reported by other researchers.[18]

The prevalence (0.4%) of commissural lip pits in our dental patients was lower than in Argentinian school-aged children (0.7%)[37] and in Israeli Jews of different ethnic origins (17.4%).[38] From 2002 to 2009, the birth prevalence of cleft lip with or without cleft palate was 0.1% for newborns in Taiwan,[39] which is lower than the prevalence (0.4%) we encountered in this study. This discrepancy may be because of the clustered effect since most cleft lip and cleft palate patients visited the craniofacial center of the Chang Gung Memorial Hospital for treatment.

The prevalence rates of oral precancerous lesions such as oral leukoplakia, erythroleukoplakia, and erythroplakia in our dental patients were much lower than the rates reported in previous studies.[1–4,8,10,12,25] In Taiwan, betel quid chewing, cigarette smoking, and alcohol drinking are three major etiological factors leading to oral precancerous lesions and cancers. Our study may have had a lower prevalence rates of oral precancerous lesions because most oral precancer and cancer patients go to special departments for oral diagnosis or oral and maxillofacial surgery for treatment, and because our dental department is not the major center for the treatment of oral precancers and cancers.

In conclusion, the results of this study provide important information about the types and prevalence of oral mucosal lesions and developmental anomalies in dental patients in a teaching hospital in northern Taiwan. We found that the most common lesion was Fordyce granules (82.8%), followed in descending order by buccal exostosis (34.1%), torus mandibularis (24.2%), torus palatinus (21.1%), lingual varices (16.2%), and recurrent aphthous ulcerations (4.3%). Fordyce granules, lingual varices, and buccal exostosis were the three most common oral mucosal lesions and developmental anomalies in elderly patients. Fordyce granules, buccal exostosis, torus mandibularis, lingual varices, and OSF were more prevalent in men than in women. These data can serve as baseline data for future studies on the type and prevalence of different oral lesions and developmental anomalies in the general population in Taiwan.

Conflicts of interest

The authors have no conflicts of interest relevant to this article.

References

1. Axéll T. A prevalence study of oral mucosal lesions in an adult Swedish population. Thesis. *Odontol Revy Suppl* 1976;36:1–103.
2. Bouquot JE. Common oral lesions found during a mass screening examination. *J Am Dent Assoc* 1986;112:50–7.
3. Zain RB, Ikeda N, Razak IA, et al. A national epidemiological survey of oral mucosal lesions in Malaysia. *Community Dent Oral Epidemiol* 1997;25:377–83.
4. Shulman JD, Beach MM, Rivera-Hidalgo F. The prevalence of oral mucosal lesions in U.S. adults: data from the Third National Health and Nutrition Examination Survey, 1988-1994. *J Am Dent Assoc* 2004;135:1279–86.
5. Dos Santos PJ, Bessa CF, de Aguiar MC, do Carmo MA. Cross-sectional study of oral mucosal conditions among a central Amazonian Indian community, Brazil. *J Oral Pathol Med* 2004;33:7–12.
6. Mumcu G, Cimilli H, Sur H, Hayran O, Atalay T. Prevalence and distribution of oral lesions: a cross-sectional study in Turkey. *Oral Dis* 2005;11:81–7.
7. Al-Mobeeriek A, AlDosari AM. Prevalence of oral lesions among (48%) dental patients. *Ann Saudi Med* 2009;29:365–8.
8. Kovac-Kovacic M, Skaleric U. The prevalence of oral mucosal lesions in a population in Ljubljana, Slovenia. *J Oral Pathol Med* 2000;29:331–5.
9. Zachariah J, Mathew B, Varma NA, Iqbal AM, Pindborg JJ. Frequency of oral mucosal lesions among 5000 individuals in Trivandrum, South India. Preliminary report. *J Indian Dent Assoc* 1966;38:290–4.
10. Axell T, Zain RB, Siwamogstham P, Tantiniran D, Thampipit J. Prevalence of oral soft tissue lesions in outpatients at two Malaysian and Thai dental schools. *Community Dent Oral Epidemiol* 1990;18:95–9.
11. Darwazeh AM, Pillai K. Prevalence of tongue lesions in 1013 Jordanian dental outpatients. *Community Dent Oral Epidemiol* 1993;21:323–4.
12. Ikeda N, Handa Y, Khim SP, et al. Prevalence study of oral mucosal lesions in a selected Cambodian population. *Community Dent Oral Epidemiol* 1995;23:49–54.
13. Kramer IR, Pindborg JJ, Bezroukov V, Infirri JS. Guide to epidemiology and diagnosis of oral mucosal diseases and conditions. World Health Organization. *Community Dent Oral Epidemiol* 1980;8:1–26.
14. Langlais RU, Miller CS. *Color Atlas of Common Oral Diseases*. Baltimore, MD: Williams & Wilkins, 1992.
15. Gorsky M, Buchner A, Fundoianu-Dayan D, Cohen C. Fordyce's granules in the oral mucosa of adult Israeli Jews. *Community Dent Oral Epidemiol* 1986;14:231–2.
16. Darwazeh AM, Pillai K. Oral lesions in a Jordanian population. *Int Dent J* 1998;48:84–8.
17. Reichart PA. Oral mucosal lesions in a representative cross-sectional study of aging Germans. *Community Dent Oral Epidemiol* 2000;28:390–8.
18. Rajendran R, Sivapathasundharam B, eds. *Shafer's Textbook of Oral Pathology*, 6th ed. Noida, India: Elsevier Reed, 2009.
19. Sawair FA, Shayyab MH, Al-Rababah MA, Saku T. Prevalence and clinical characteristics of tori and jaw exostoses in a teaching hospital in Jordan. *Saudi Med J* 2009;30:1557–62.
20. Jainkittivong A, Langlais RP. Buccal and palatal exostoses: prevalence and concurrence with tori. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2000;90:48–53.
21. García-García AS, Martínez-González JM, Gómez-Font R, Soto-Rivadeneira A, Oviedo-Roldán L. Current status of the torus palatinus and torus mandibularis. *Med Oral Patol Oral Cir Bucal* 2010;1:353–60.
22. Al-Bayaty HF, Murti PR, Matthews R, Gupta PC. An epidemiological study of tori among 667 dental outpatients in Trinidad & Tobago, West Indies. *Int Dent J* 2001;51:300–4.
23. Haugen LK. Palatine and mandibular tori. A morphologic study in the current Norwegian population. *Acta Odontol Scand* 1992;50:65–77.
24. Corbet EF, Holmgren CJ, Phillipsen HP. Oral mucosal lesions in 65–74-year-old Hong Kong Chinese. *Community Dent Oral Epidemiol* 1994;22:392–5.
25. Nevalainen MJ, Närhi TO, Ainamo A. Oral mucosal lesions and oral hygiene habits in the home-living elderly. *J Oral Rehabil* 1997;24:332–7.
26. van Wyk CW, Farman AG, Staz J. Oral health status of institutionalized elderly Cape Coloreds from the Cape Peninsula of South Africa. *Community Dent Oral Epidemiol* 1977;5:179–84.

27. Vasconcelos BC, Novaes M, Sandrini FA, Maranhão Filho AW, Coimbra LS. Prevalence of oral mucosa lesions in diabetic patients: a preliminary study. *Braz J Otorhinolaryngol* 2008;74: 423—8.
28. Ettinger RL, Manderson RD. A clinical study of sublingual varices. *Oral Surg Oral Med Oral Pathol* 1974;38:540—5.
29. Jainkittivong A, Aneksuk V, Langlais RP. Oral mucosal conditions in elderly dental patients. *Oral Dis* 2002;8:218—23.
30. Lin HC, Corbet EF, Lo EC. Oral mucosal lesions in adult Chinese. *J Dent Res* 2001;80:1486—90.
31. Furlanetto DL, Crighton A, Topping GV. Differences in methodologies of measuring the prevalence of oral mucosal lesions in children and adolescents. *Int J Paediatr Dent* 2006;16:31—9.
32. Kleinman DV, Swango PA, Niessen LC. Epidemiologic studies of oral mucosal conditions—methodologic issues. *Community Dent Oral Epidemiol* 1991;19:129—40.
33. Rioboo-Crespo Mdel R, Planells-del Pozo P, Rioboo-García R. Epidemiology of the most common oral mucosal diseases in children. *Med Oral Patol Oral Cir Bucal* 2005;10: 376—87.
34. Bergdahl M, Bergdahl J. Burning mouth syndrome: prevalence and associated factors. *J Oral Pathol Med* 1999;28:350—4.
35. Grushka M. Clinical features of burning mouth syndrome. *Oral Surg Oral Med Oral Pathol* 1987;63:30—6.
36. Lin HP, Wang YP, Chia JS, Chiang CP, Sun A. Modulation of serum gastric parietal cell antibody level by levamisole and vitamin B12 in oral lichen planus. *Oral Dis* 2011;17: 95—101.
37. Sedano HO. Congenital oral anomalies in Argentinian children. *Community Dent Oral Epidemiol* 1975;3:61—3.
38. Gorsky M, Buchner A, Cohen C. Commissural lip pits in Israeli Jews of different ethnic origin. *Community Dent Oral Epidemiol* 1985;13:195—6.
39. Lei RL, Chen HS, Huang BY, et al. Population-based study of birth prevalence and factors associated with cleft lip and/or palate in Taiwan 2002-2009. *PLOS One* 2013;8:e58690.