



Clinical Assessment of Frenum Morphology and Attachment in Malaysian Children

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Abstract

Objective: To determine the prevalence of various types and attachment level of maxillary frenum in Malaysian children. **Material and Methods:** A cross-sectional study was conducted in a total of 200 children of age ranging from 2 to 15 years. Photographs of maxillary frenum were taken and their types and level of attachment were recorded by using Placek's classification and modified Sewerin typology. Children were divided into 3 groups based on age: between 2-5, 6-11 and 12-15 years. Descriptive analysis was carried out to determine the frequency of frenum types and level of attachment. The relationship of frenal attachment with gender, and age were studied. Data collected was analyzed using descriptive statistics (frequencies, percentages, means and standard deviation). Statistical Package for Social Sciences (SPSS) version 19.0 was used to analyze the data. **Results:** The most common type was mucosal type of attachment (75%) and the least common was papillary penetrating (4.5%) based on Placek's classification whereas for modified Sewerin's typology, simple frenum (73%) was the most prevalent, followed by simple with nodule frenum (11.5%). There was no significant difference in the frenum attachment between the two genders. Mucosal and gingival attachment was significantly higher in older age group whereas papillary and papillary penetrating was higher in younger age group. **Conclusion:** This study showed that attachment of frenum in children changes according to age and whereas gender plays no role in portraying the difference. Hence, clinicians must be able to identify the different types of MMLF during dental examination to avoid any unnecessary surgical interventions particularly during the period of development.

Keywords: Labial Frenum; Child; Adolescent; Mouth Mucosa.

Introduction

The median maxillary labial frenum (MMLF) is a thin fold of mucous membrane with enclosed muscle fibers originating from orbicularis oris muscle of upper lips that attach at the lips to the alveolar mucosa and underlying periosteum. It is found on the underside of the center of the upper lip that connects to the midline of the attached gingiva between the central incisors. It adapts to any of the normal movements of the lip [1,2].

As with all body parts, MMLF has demonstrated variations and anomalies [3,4]. It is subjected to variations in shape, size, and position during the different stages of growth and development. In young children, the frenum is generally wide and thick, becoming thinner and smaller during growth and eventually, it tends to diminish in size and importance [5]. The frenum tends to migrate apically due to the eruption of primary incisors, development of maxillary sinus and also the vertical growth of alveolar process. The MMLF is also a posteruptive remnant of the tectolabial bands [2]. Histologically, the MMLF consists of a stratified squamous epithelium that covers highly vascular, loose fibrous connective tissue with an abundance of elastic fibers [2,6].

Generally, during the oral examination of the patient, the dentist gives very little importance for frenum examination, which is assessing its morphology and attachment. However, the dentist should be aware of the presence of abnormal frenum due to several clinical problems associated with it such as loss of papilla, recession, midline diastema, interference with oral hygiene (which is a local anatomic factor for plaque accumulation and retention), misalignment of teeth and later in life, affect the denture fit or retention [7,8]. This aberrant frenum can be detected visually, by applying tension over it to see the movement of papillary tip or blanching of interdental papilla produced due to ischemia of the region. The literature showed various complications resulting from oral piercings [9]. Of the different piercings in the mouth, MMLF piercing is also popular and can result in complications [9]. Other than that, absence of frenum is associated with Holoprosencephaly [10,11], whereas bifid frenum is associated with W syndrome [12].

Due to the clinical reasons as mentioned above, some authors introduced a clinical morphological classification of maxillary frenum insertion, depending on the anatomic location of attachment [13]. The prevalence of different types of maxillary labial frenum has been examined in adults and teens, but studies utilizing this classification in children are lacking. In addition to that, the most frequent frenum typology used is the one established by Sewerin [14]. For this study, both Placek's classification [13] and modified Sewerin typology [14] were applied. By applying the clear-cut way of classifications mentioned above, clinical problems faced due to abnormal frenal attachment will be able to be resolved.

Literature review reveals that limited studies had been done on investigating the association of diverse morphology of maxillary labial frenum. Therefore, the objective of this study was to evaluate the prevalence of the variations of the median maxillary labial frenum in a diverse ethnic population of children in Malaysia.

Material and Methods

Study Population

A total of 200 children with age ranging from 2-15 years, who are walk-in patients to the Pediatric Dentistry Clinic were included in this study. The children were divided into 3 groups such as 2-5 years old, 6-11 years old, and 12-15 years old.

Exclusion Criteria

Children with cleft lip, congenital deformities, orofacial syndromes, history of surgical intervention in the maxillary labial area, trauma, with orthodontic treatment or on medications known to affect the gingiva.

Clinical Examination

A pilot study was conducted to ensure the feasibility of this study methodology. A special proforma was used in the pilot study and then changes were made to the proforma to correct the drawbacks of it. Demographics characteristics of the patient, which includes name, age, and gender, were also recorded.

The examination comprised of gently distending the maxillary lip and performing a direct visual examination under natural light. Photographs were taken from the frontal view, left lateral view and right lateral view with a Panasonic Lumix camera model DMC-FZ28 (Panasonic Corporation of North America, One Panasonic Way, Secaucus, NJ, USA). 5 Megapixels was used as the standard camera for this study. The lens of the camera was placed approximately 15cm away from the teeth, parallel to the vertical plane and the pictures were taken when the image of the frenum was in focus. This was standardized throughout the study. The photographs were transferred to a computer and viewed in full screen mode. The pictures were scored by one calibrated dentist. MMLF attachment was assessed according to previous authors [13] (Figure 1).



Figure 1. Types of MMLF attachment [13]: A = Mucosal; B = Gingival; C = Papillary and D = Papillary penetrating.

MMLF morphology was assessed according to modified Sewerin's typology [14]: I = Simple Frenum; II = Simple With Nodule; III = Persistent tectolabial; IV = Simple with Appendix; V = Simple with nichum; VI = Bifid; VII = Double; VIII = Two or more variation and IX = Absence (Figure 2).

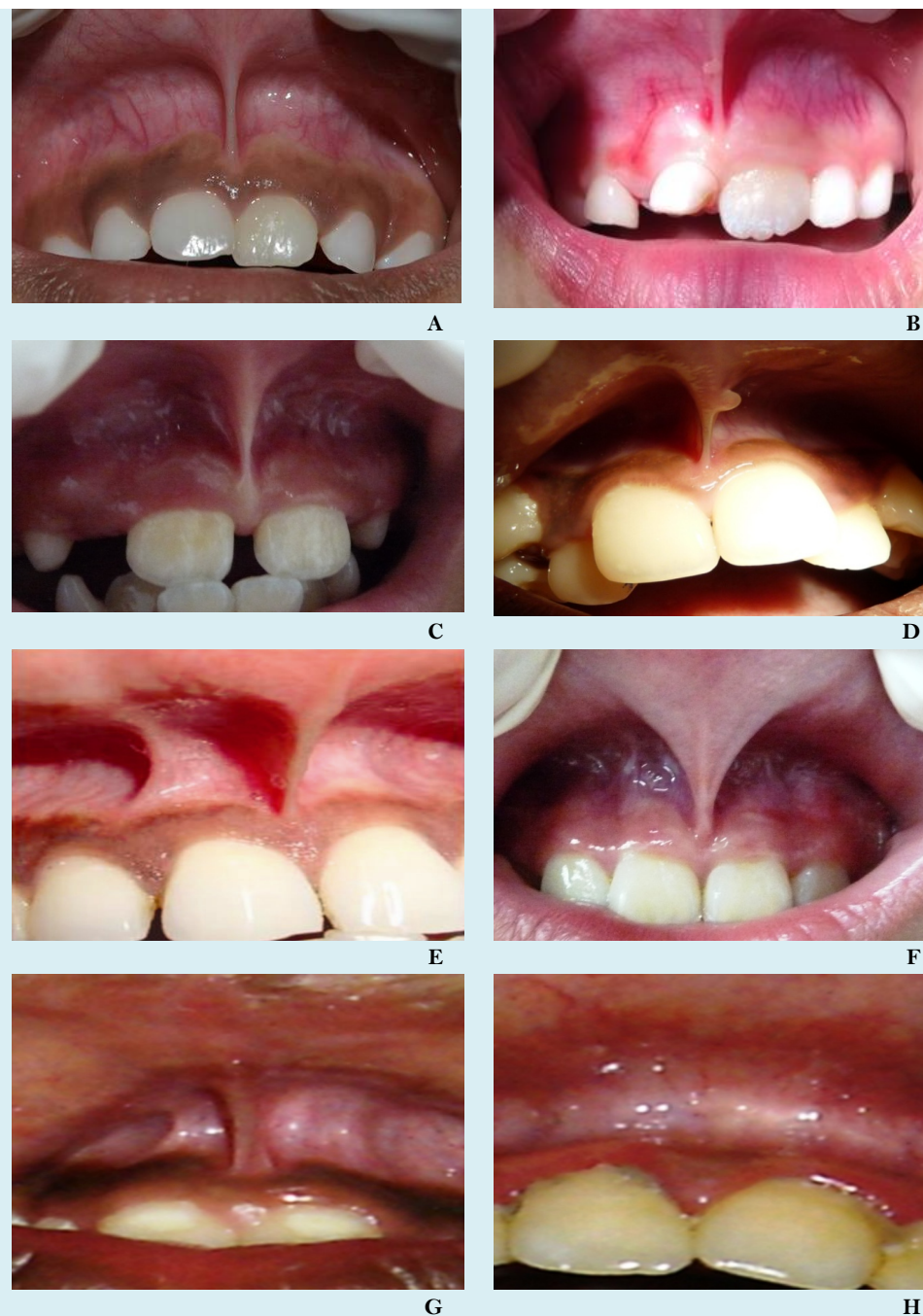


Figure 2. Types of MMLF morphology according to modified Sewerin's typology [14]: A = Simple; B = Simple with nodule; C = Persistent tectolabial; D = Simple with appendix; E = Simple with nichum; F = Bifid; G = Double and H = Absent.

Statistical Analysis

Data collected was analyzed using descriptive statistics (frequencies, percentages, means and standard deviation). Statistical Package for Social Sciences (SPSS) version 19.0 was used to analyze the data.

Ethical Aspects

This study was approved by the local Institutional Review Board. All parents or guardians of the children who participated were informed regarding the study and consent was obtained.

Results

A total of 200 children were examined, with a mean age of 8.6 ± 3.2 years (Table 1). The gender distribution was even, with 100 children being male (50%), aged 8.6 ± 3.0 , and 100 being female (50%), aged 8.5 ± 3.4 . The ethnicity of the children included were 14% Malays ($n = 28$), 43% Chinese ($n = 86$), 42.5% Indian ($n = 85$) and 0.5% of others races ($n = 1$).

Table 1. Distribution of sample based on age.

Groups	Age (Years)	Frequency	
		n	%
G1 [37]	2	3	1.5
	3	3	1.5
	4	12	6.0
	5	19	9.5
G2 [117]	6	30	15.0
	7	18	9.0
	8	17	8.5
	9	18	9.0
	10	16	8.0
	11	18	9.0
	12	15	7.5
G3 [46]	13	14	7.0
	14	16	8.0
	15	1	0.5
Total		200	100.0

The most prevalent type of attachment was the mucosal type of attachment (seen in 75% of the children), followed by gingival attachment (12%). There was no significant difference observed between genders (Table 2).

Table 2. Distribution of maxillary labial frenum attachment.

Types	Overall		Male		Female	
	n	%	n	%	n	%
Mucosal	152	76.0	76	76.0	76	76.0
Gingival	24	12.0	10	10.0	14	14.0
Papillary	15	7.5	8	8.0	7	7.0
Papillary Penetrating	9	4.5	6	6.0	3	3.0
Total	200	100.0	100	100.0	100	100.0

Papillary (53.3%) and papillary penetrating (66.4%) are more prevalent in the age group 6-11 years old and lesser seen in the age group 12-15 years old (Table 3).

Table 3. Distribution of frenal attachment in relation to age.

Groups	Age	Mucosa	Gingiva	Papillary	Papillary penetrating	Total	
		n	n	n	n	n	%
G1	2	3	0	0	0	3	1.5
	3	1	0	2	0	3	1.5
	4	9	1	2	0	12	6.0
	5	12	2	2	3	19	9.5
G2	6	23	5	1	1	30	15.0
	7	14	0	1	4	18	9.0
	8	11	5	1	0	17	8.5
	9	12	2	3	1	18	9.0
	10	15	0	2	0	16	8.0
	11	14	2	0	0	18	9.0
G3	12	12	3	0	0	15	7.5
	13	14	0	0	0	14	7.0
	14	11	4	1	0	16	8.0
	15	1	0	0	0	1	0.5
Total		152	24	15	9	200	100.0

The mean age seen shows that papillary and papillary penetrating type of attachment are seen more commonly in younger age group with a mean of 7.1 ± 3.2 and 6.4 ± 1.3 respectively while the mucosal and gingival attachment are present in older age group with mean of 8.8 ± 3.2 and 9.0 ± 3.2 respectively (Table 4).

Table 4. Distribution of children's age in relation to frenal attachment.

Types	Frequency		Age (Mean $\pm$ SD)
	n	%	
Mucosal	152	76.0	8.8 ± 3.2
Gingival	24	12.0	9.0 ± 3.2
Papillary	15	7.5	7.1 ± 3.2
Papillary Penetrating	9	4.5	6.4 ± 1.3

According to modified Sewerin's classification on frenum typology, simple frenum (73%) was the most prevalent, followed by simple with nodule frenum (11.5%). There was no significant association of frenum distribution in relation to gender (Table 5).

Table 5 Distribution of maxillary labial frenum based on modified Sewerin's typology.

Types	Overall		Male		Female	
	n	%	n	%	n	%
Simple Frenum	146	73.0	71	71.0	75	75.0
Simple With Nodule	23	11.5	15	15.0	8	8.0
Persistent tectolabial	5	2.5	3	3.0	2	2.0
Simple with Appendix	10	5.0	4	4.0	6	6.0
Simple with nichum	0	0.0	0	0.0	0	0.0
Bifid	15	7.5	6	6.0	9	9.0
Double	0	0.0	0	0.0	0	0.0
Two or more variation	1	0.5	1	1.0	0	0.0
Absence	0	0.0	0	0.0	0	0.0
Total	200	100.0	100	100.0	100	100.0

However, upon dividing the age group into 3 groups, a significant difference was seen in which persistent tectolabial (80%) and bifid frenum (53.3%) were prominent in the younger age group while in older age group, simple frenum was the most prominent (Table 6).

Table 6. Distribution of frenum based on age.

Groups	Age	Modified Sewerin's Typology									Total
		I	II	III	IV	V	VI	VII	VIII	IX	
G1	2	2	0	0	0	0	1	0	0	0	3
	3	2	0	0	0	0	1	0	0	0	3
	4	8	2	0	0	0	2	0	0	0	12
	5	13	0	1	0	0	4	0	1	0	19
G2	6	21	4	1	2	0	2	0	0	0	30
	7	10	4	2	1	0	1	0	0	0	18
	8	16	0	0	1	0	0	0	0	0	17
	9	12	3	1	1	0	1	0	0	0	18
	10	13	1	0	1	0	1	0	0	0	16
	11	13	2	0	2	0	1	0	0	0	18
G3	12	12	3	0	1	0	0	0	0	0	15
	13	11	2	0	0	0	0	0	0	0	14
	14	12	2	0	1	0	1	0	0	0	16
	15	1	0	0	0	0	0	0	0	0	1
Total		146	23	5	10	0	15	0	1	0	200

I = Simple Frenum; II = Simple With Nodule; III = Persistent tectolabial; IV = Simple with Appendix; V = Simple with nichum; VI = Bifid; VII = Double; VIII = Two or more variation and IX = Absence.

With reference to the mean age, persistent tectolabial frenum and bifid frenum were seen in younger age whereas simple, simple with nodule and simple with appendix were seen in older age (Table 7).

Table 7. Distribution of children mean's age in relation to frenal typology (modified Sewerin's typology).

Types	N	Age (Mean $\pm$ SD)
Simple Frenum	146	8.7 $\pm$ 3.2
Simple With Nodule	23	9.1 $\pm$ 3.2
Persistent tectolabial	5	6.8 $\pm$ 1.5
Simple with Appendix	10	8.3 $\pm$ 2.9
Simple with nichum	0	-
Bifid	15	6.4 $\pm$ 3.3
Double	0	-
Two or more variation	1	5
Absence	0	-

Discussion

The present study investigated the prevalence of different types of maxillary labial frenum attachment in 200 children of different ethnic backgrounds, aged 2-15 years old, in Malaysia. From this study, it was found that the most prevalent type of attachment was the mucosal type of

attachment and this result is in accordance to the previous studies [15]. In contrast to previous studies done on Nepalese [16] and Brazilian [17] children, the most common type of frenal attachment was the gingival type and the least common was papillary penetrating type. It was observed that papillary and papillary penetrating were more prevalent in the age group 6-11 years old. This indicates that the frenal attachment level generally moves apically with increasing age [1,2]. Therefore, patient with this type of frenal attachment should be put under observation during mixed dentition as data revealed that eventually the midline diastema closes, as level of attachment will shift apically.

Papillary and papillary penetrating type of attachment are seen more commonly in younger age group and these results are consistent with the previous longitudinal study [18], which reported that from age 9 to 16, the frenal attachment might move from a more coronal to a more apical position, while movement in the opposite direction was never detected. Simple frenum was the most prevalent and this is in accordance to previous study [19], which stated that the most prevalent frenum was the simple frenum in their study with no significant association in relation to gender.

There was no gender-wise difference in the frenal attachment according to both Placek's classification [13] and modified Sewerin's typology [14] (Tables 2 and 5). This was statistically significant as the sample collected was evenly distributed. However, in this study, racial differences in frenal attachment could not be significantly proven, as the sampling distribution was not of equal proportions. Hence, further investigation is required with even larger sample size and more equal proportions to study the association of races with morphology and attachment of MMLF.

Conclusion

The most common type of attachment in Malaysian population according to Placek's classification was the mucosal type of attachment, whereas according to modified Sewerin's classification, simple frenum was the most prevalent. This study also showed that gender plays no role in portraying the difference in frenal attachment. However, age was significantly associated with the level of frenal attachment whereby evidence suggested that with increasing age, the level of frenal attachment will shift to a more apical position. In addition to this, persistent tectolabial is seen to be associated with midline diastema but it is seen that the midline diastema closes, as the patient gets older. Hence, patient with this type of frenal attachment should be reviewed and kept under observation. The dentist should focus more on other etiologies of midline diastema. The overall evidence suggests that there are many variations of MMLF therefore the clinicians must be able to identify the different types of frenal attachment during dental examination to avoid any unnecessary surgical interventions particularly during the period of development and evolution of MMLF.

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