The Association between the Midline Diastemas and the Superior Labial Frenum

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Background: *The superior labial frenum attachment may instigate or associate with the midline diastema. Previous studies on the distribution of the superior labial frenum attachment in children are limited, especially in the infantile period.*
Objective: *The purpose was to examine the prevalence of the superior labial frenums that are related to the occurrence of a persisting midline diastema in the infants (0 to 6 months of age) and children (3 to 12 years of age).*
Material and Method: *A cross-sectional study was conducted. The study population consisted of 124 infants from the Tongue Tie Clinic of Siriraj Hospital and 303 children from the dental clinic of Sikhiu Hospital. The patients were clinically examined for the superior labial frenum attachment and the association with a persistent midline diastema. Descriptive statistics and SPSS program were used for analysis.*
Results: *The 124 infants, mean age 11.9 days, were 58.1% male and 41.9% female. The prevalence of various forms of the superior labial frenum attachment was as follows: gingival 29%, papillary 59.7%, and papillary penetrating 11.3%. The 303 children, mean age 8.7 years, were 54.1% male and 45.9% female.The prevalence of the superior labial frenum attachment was as follows: mucosal 18.8%, gingival 70%, papillary 7.3%, and papillary penetrating 4%. The prevalence of the midline diastema in the children population was 7.3% and most of it was the papillary penetrating type.*
Conclusion: *The papillary penetrating type of superior labial frenum should be closely monitor. If it still persist throughout the infantile period, it should be considered for correction to prevent further anomalies especially in the midline diastema.*

Keywords: *Midline diastema, Maxillary midline diastema, Superior labial frenum*

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The superior labial frenum is the continuous band of tissue attached from the inner side of the upper lip extending over and across the alveolar ridge to be inserted in the incisive papilla[1]. The broad attachment and position of the superior labial frenum may contribute to the abnormal tooth alignment in the children such as the midline diastema[2,3] (Fig. 1). The midline diastema is a space or gap between the maxillary central incisors. The space can be a normal growth during the primary and mixed dentition period and generally is closed by the time the maxillary canines erupt.

In addition, the abnormal superior labial frenum can also be the cause of malocclusion producing undesirable cosmetic results (Fig. 2A), and it may interfere with tooth brushing by making it difficult to place the brush at the proper level. It is also a space for accumulation of food particles which then can cause dental caries[4,5] (Fig. 2B). Moreover, it may restrict movement of the upper lip that interferes with speech[5-7]. Because the attachment position of the superior labial frenum may contribute to several conditions in children, we concern especially in the midline diastema, which the condition is frequently seen in preschool children. Therefore, the early detection of the abnormal superior labial frenum that relates to a persisting midline diastema may help the surgeon to consider for treatment during the infantile period to prevent the midline diastema in the future. The purpose of the present study was undertaken to determine the prevalence of the different types of the superior labial frenums that are related to the occurrence of a persisting

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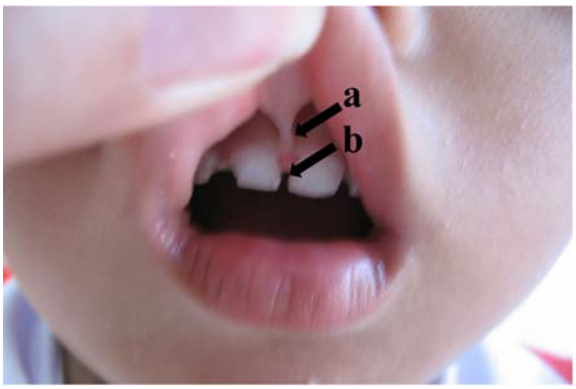

Fig. 1 The superior labial frenum (A) associated with the midline diastema (B).

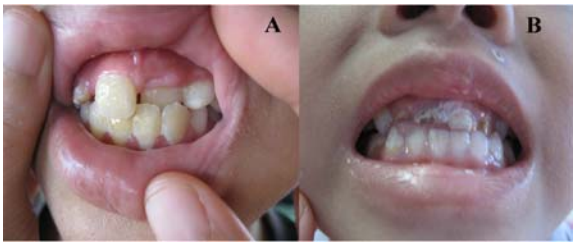

Fig. 2 Malocclusion associated with the abnormal superior labial frenum can be the cause of undesirable cosmetic result (A), the dental caries with food accumulation in the superior labial frenum (B).

midline diastema.

Material and Method

The study design was a cross-sectional study. Local ethical approval was obtained prior to commencement of this study and parents provided written informed consent.

The study population was divided into 2 groups that consisted of 124 infants (0 to 6 months of age) from the Tongue Tie Clinic of Siriraj Hospital and 303 children (3 to 12 years of age) from the dental clinic of Sikhiu Hospital. Data evaluated were age, sex, and types of the superior labial frenum attachment in both groups. As for the children population, the occurrence of a persisting midline diastema was evaluated correspondingly. The superior labial frenum was classified according to the Placek et al classification (1974) into: mucosal, gingival, papillary and papillary penetrating[8]. Each type of the superior labial frenum is defined as follows; the mucosal type is for the frenum attachment to the mucosa, the gingival type is for attachments to the gingiva, the papillary type is for attachments to the interdental papilla and the papillary penetrating type is for the frenum attachments into the hard palate.

In addition, the exclusion criteria were patients with abnormalities of the oral cavity such as cleft lip or cleft palate, patients with previous history of oral surgery, and patients with mesiodens or odontoma. Descriptive statistics and SPSS program were used for analysis in this study.

Results

In the infantile population, 58.1% (n = 72) were male and 41.9% (n = 52) were female while 54.1% (n = 164) were male and 45.9% (n = 139) were female in the children population. Mean age were 11.9 days in the infantile population and 8.7 years in the children population. The various types of the superior labial frenum attachment in the infantile population (Fig. 3, 4) were as follow: mucosal 0%, gingival 29% (n = 36), papillary 59.7% (n = 74), and papillary penetrating 11.3% (n = 14) whereas in the children population (Fig. 5, 6) were as follow: mucosal 18.8% (n = 57), gingival 70% (n = 212), papillary 7.3% (n = 22), and papillary penetrating 4% (n = 12). There were no significant statistical differences in the genders and classification between the two groups.

In the children population, the prevalence of midline diastema was 7.3%. The types of superior labial frenum that associated with the midline diastema were gingival 0.3% (n = 1), papillary 3% (n = 9), papillary penetrating 4% (n = 12) and the severe form of midline diastema was closely related to papillary penetrating type. Moreover, four children had pronunciation problems but there was no associated midline diastema presented among them at the time of the study. The dental problems found during this study were gingivitis, dental caries, and malocclusion that were associated with the abnormal superior labial frenum and midline diastema.

Discussion

The midline diastema is a space or gap, most often seen between the two upper front teeth. Keene HJ described the midline diastema as anterior midline spacing greater than 0.5 mm between the proximal surfaces of adjacent teeth[9,10]. At some stages of dental development, it is normal to have a diastema but it eventually closes during further development. Most parents are concerned about the spaces between the front teeth of their children and seek treatment for cosmetic reasons even during preschool period and it

Fig. 3 The gingival (A), papillary (B), and papillary penetrating (C) types were found in the infantile population.

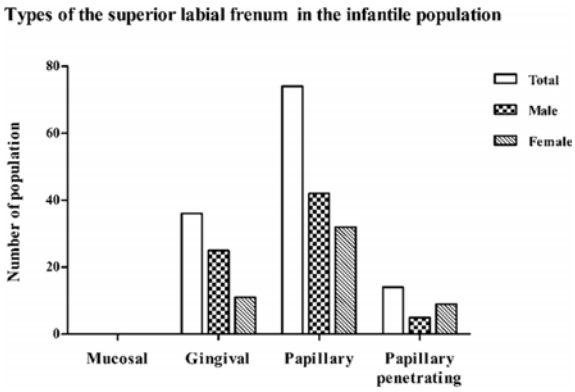

Fig. 4 Number of the infantile population with different types of the superior labial frenum. Each column represents the total number, the number of male and female infantile population with the superior labial frenum, respectively.

Fig. 5 The mucosal (A), gingival (B), papillary (C), and papillary penetrating (D) types were found in the children population.

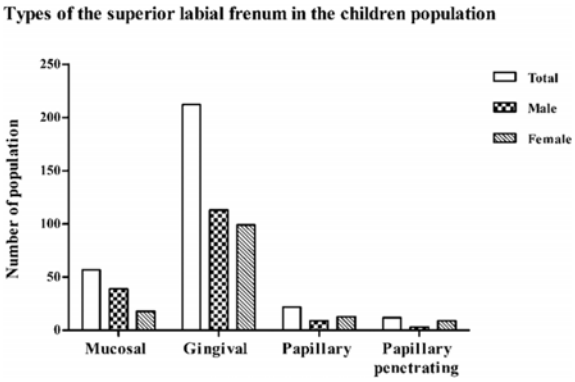

Fig. 6 Number of the children population with different types of the superior labial frenum. Each column represents the total number, the number of male and female children population with the superior labial frenum, respectively.

also affects the speech, thereby certain sounds like "S" is not pronounced properly.

In the past, Campbell et al stated that the midline diastema could be transient or created by developmental, pathological or iatrogenic factors. Likely are oral habits, soft tissue imbalances, physical impediments, dental anomalies and/or skeletal disharmonies, as well as normal dentoalveolar development. In addition, the low attachment of fleshy superior labial frenum is often associated with midline diastema[10]. Kaimenyi JT (1998) and Diaz-Pizan ME (2006) reported the occurrence of the midline diastema and the superior labial frenum attachments amongst school children are 35% and 25%[5,11]. Moreover, Kaimenyi JT also reported the most common location of the superior labial frenum attachment among children was the gingiva (50%)[11]. However, with the eruption of the lateral incisors and the permanent canines during 8 to 9 years of age, the midline diastema will be reduced if the superior labial fenum is normal in both the attachment location and the morphology. In 2004, Bergstrom et al reported that two years after frenectomy in school children with prominent superior labial frenums and midline diastemas, the diastemal closure was significantly greater than the control group[12].

The present study showed the highest number of the superior labial frenum in the infantile population was the papillary type and followed by gingival and papillary penetrating types, respectively. While in the children population, the highest number of the superior labial frenum was the gingival type and followed by mucosal, papillary and papillary penetrating types, respectively. These results showed the same pattern as the previous studies in the US, Kenya, and India[11,13,14]. In addition, the prevalence of the midline diastema in this study population was 7.3% with the majority being associated with the superior labial frenum in the papillary penetrating type.

With the change in prevalence of the types of the superior labial frenum between both age groups as demonstrated in the presented study, it could be hypothesize that the frenum attachment location would recede to lower attachments such as mucosal or gingival type over time. The significance of the papillary penetrating type still existing in the children population in association with a persisting midline diastema could suggest it to be one of the causes of the diastema.

Therefore, the papillary penetrating type of the superior labial frenum should be closely monitored. If it still persist throughout the infantile period, it should be considered for correction, to prevent further malocclusion anomalies especially in the midline diastema.

This study had limitations due to the cross-sectional study between two different population groups. Therefore, further prospective study is needed to be done in order to find out the proper management and confirm that the treatment during the infantile period may be the best way to prevent further anomalies in the childhood.

In conclusion, the papillary penetrating type of the superior labial frenum should be considered for correction if it still persist throughout the infantile period to prevent further anomalies especially in the midline diastema, whereas other less severe form from the papillary type may be closely monitored.

What is already known on this topic?

The superior labial frenum is a mucous membrane fold that attaches the upper lip and the incisive papilla. According to the position, the superior labial frenum attachments have been classified as mucosal, gingival, papillary and papilla penetrating type. The attachment position of the superior labial frenum may contribute to the abnormal tooth alignment such as midline diastema in children.

What this study adds?

The present study revealed that the prevalence of the midline diastema in the children population is 7.3% and the severe form of midline diastema was closely related to papillary penetrating type. The early detection of the abnormal superior labial frenum in the infantile period may be a useful indicator for further appropriate treatment in order to prevent midline diastema in the childhood.

Documentation of the IRB or Animal Care committee approval

The project entitled "The association between the midline diastemas and the superior labial frenum in Thailand" has been certificated by Siriraj Institutional Review Board for Human Research, based on the declaration of Helsinki and Protocol number: 019/2553 (EC1).

Potential conflicts of interest

None.

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ความสัมพันธ์ของฟันตัดกลางบนห่างอันเนื่องมาจากเนื้อเยื่อรั้งริมฝีปากบนของผู้ป่วยเด็กในประเทศไทย

มงคล เลาหเพ็ญแสง, จุฬาทิพย์ นาคาเริงฤทธิ์, บงกช เพชรสงคราม, มนวัฒน์ เงินฉ่ำ

ภูมิหลัง: ความสัมพันธ์ของเนื้อเยื่อรั้งริมฝีปากบนกับฟันตัดกลางห่าง ยังได้รับการศึกษาน้อย โดยเฉพาะตั้งแต่ระยะทารก

วัตถุประสงค์: ศึกษาความชุกของการเกิดเนื้อเยื่อรั้งริมฝีปากบนในทารกแรกเกิดถึงอายุ 6 เดือน และเด็กช่วงอายุ 3 ถึง 12 ปี รวมถึงความสัมพันธ์กันของเนื้อเยื่อนี้กับภาวะฟันตัดกลางบนห่าง

วัสดุและวิธีการ: ประชากรในการศึกษาเป็นทารก 124 คน จากคลินิกพังผืดใต้ลิ้น โรงพยาบาลศิริราช และเด็ก 303 คน จากคลินิกฟันของโรงพยาบาลสี่คิ้ว ข้อมูลที่นำมาใช้ในการศึกษา คือ ลักษณะของเนื้อเยื่อรั้งริมฝีปากบน ในประชากรทั้งสองกลุ่ม และความสัมพันธ์กับฟันตัดกลางบนห่าง

ผลการศึกษา: ทารก 124 ราย อายุเฉลี่ย 11.9 วัน เป็นชาย 58.1% หญิง 41.9% มีลักษณะการเกาะของเนื้อเยื่อ รั้งริมฝีปากบน ดังนี้ คือ gingival 29%, papillary 59.7% และ papillary penetrating 11.3% เด็ก 303 ราย อายุเฉลี่ย 8.7 ปี เป็นชาย 59.1% หญิง 45.9% มีลักษณะการเกาะของเนื้อเยื่อรั้งริมฝีปากบนเป็น mucosal 18.8%, gingival 70%} papillary 7.3% และ papillary penetrating 4% ในขณะที่มีความชุกของฟันตัดกลางบนห่าง 7.3% และส่วนใหญ่สัมพันธ์กับ papillary penetrating type

สรุป: papillary penetrating type ของเนื้อเยื่อรั้งริมฝีปากบน ควรได้รับการติดตามดูอย่างใกล้ชิดหากไม่เลื่อนขึ้นไป หลังจากพ้นช่วงทารกควรพิจารณาทำการรักษาเพื่อป้องกันไม่ให้เกิดภาวะฟันติดบนห่างตามมา