Prevalence of developmental maxillary midline diastema in Taiwanese children

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Abstract Background/purpose: Midline diastema in mixed dentition is a concern for both parents and children; therefore, determining the timing of closure of developmental diastema is essential for clinical practice. Data on midline diastema in Taiwanese children are scant. The purpose of this study was to investigate the prevalence of maxillary midline diastema in different age groups of children in Taiwan and to determine the time of closure of the developmental diastema. Materials and methods: The sample population comprised elementary school children in Taichung City, Taiwan, whose ages were between 6 and 12 years. We screened a total of 1136 children and selected 917 for this study. Inclusion criteria were the presence of both permanent maxillary central incisors and absence of obvious dental or dentofacial abnormalities. Children who had a history of orthodontic treatment or crown restoration of anterior teeth were excluded. Diastema widths were measured clinically with a Boley gauge.

Results: The prevalence of diastema was 64.6% among 6-year-old children but only 14.3% among the 12-year-olds. The prevalence of diastema was higher in boys than girls after the age of 9. There were statistically significant differences between boys and girls in the prevalence of diastema at ages 9 and 12. The mean size of diastema was 1.9 mm for 6-year-olds and 1.21 mm for 12-year-old children, indicating a significant reduction of diastema size with age. Before the eruption of lateral incisors, the prevalence of midline diastema was 60.4% among all children, and it declined to 14.5% after the eruption of canines.

Conclusion: The prevalence of midline diastema decreased with age. It also declined with lateral incisor and canine eruption; it was 14.5% after canine eruption. Therefore the orthodontic intervention of diastema should be delayed until canine eruption.

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Introduction

Midline diastema in mixed dentition is the so-called “ugly duckling” stage for children. It is a concern for both parents and children; therefore, determining the timing of closure of developmental diastema is essential for clinical practice. Midline diastema is a space between the maxillary central incisors. The space can be characteristic of normal growth in primary and mixed dentition and generally is closed by the time the maxillary canines erupt. On the other hand, it can be an abnormality related to abnormal frenum, peg lateral incisors, thumb sucking, mouth breathing, tongue thrusting, bony cleft, and mesiodens.

According to epidemiologic investigations in England by Taylor (USA), Gardiner (England), and Weyman (British), the prevalence of midline diastema is high among young children. Taylor found that 97% of 6-year-old children in USA exhibited a maxillary midline diastema. Other studies have shown that the incidence was 44% among 6-year-old children, 45% among the 9-year-olds, and was only 9% among 16-year-old children. In general, the rate of midline diastema decreases dramatically between 9 and 11 years of age, then continues a gradual decline up to 15 years of age. This pattern of decrease follows the normal eruption pattern of the permanent maxillary lateral incisors and canines. Differences in race were also found to affect the percentage of children who have midline diastema. Lavelle and colleagues reported the prevalence of maxillary midline diastema was greater in African populations than among Caucasians or Asian. Horowitz studied comparable populations of 10- to 12-year-old black and white children and found that 19% of the black children exhibited a midline diastema compared with only 8% of the white children.

There are scant data on midline diastema in Taiwanese children. The purpose of this study was to investigate the prevalence of midline diastema in different age groups of children in Taiwan to determine the time of closure of developmental diastema, in order to minimize unnecessary orthodontic interventions.

Materials and methods

The sample population comprised elementary school children in Taichung City, Taiwan, whose ages were between 6 and 12 years. The children were examined during routine oral health screening at schools. Prior consent to examine the children was obtained from their parents and school authorities. Of a total of 1136 children screened, 917 children were selected for this study. Criteria used in selecting participants were: the presence of both permanent maxillary central incisors and the absence of obvious dental or dentofacial abnormalities. Children who had a history of orthodontic treatment or crown restorations of maxillary anterior teeth were excluded.

The examination included history-taking, oral examination, and diastema width measurement. The participants were first divided into male and female groups then further divided into different age groups. A diastema is defined as a space greater than 0.5 mm between the proximal surfaces of two adjacent central incisors. Diastema widths were measured clinically with a Boley Gauge (Leone orthodontic, Italy) at 1.0 mm above the incisor edge. The Chi-square test was used to test the difference between boys and girls at a confidence level of 0.05.

Results

Prevalence of maxillary midline diastema

The total sample size in this study was 917 children (481 boys and 436 girls). The prevalence of diastema was 64.6% among 6-year-old children and 53.2% among 7-year-olds, whereas it was 17.1% among 11-year-olds and 14.3% among 12-year-olds (Fig. 1). Fig. 1 illustrates a dramatic drop in the prevalence of diastema from 64.6% among the 6-year-olds to the 14.3% among the 12-year-olds.

Sex differences in the prevalence of maxillary midline diastema

At ages 7 and 8, the percentage of girls with diastema was slightly higher than that of boys, while the percentage was higher among boys after the age of 9. Among 12-year-old children, 23.2% of boys had diastema while only 5.4% of girls did (Fig. 2). Statistically significant differences were found between boys and girls in the prevalence of diastema at ages 9 and 12 when tested with 0.05 level of confidence. This means girls dental development are earlier than boys.
Size of diastema

The mean size of diastema is 1.9 mm for 6-year-olds and 1.21 mm for 12-year-olds indicating a significant reduction in diastema size with the progressing of age (Fig. 3). In other words, both the prevalence and the size of diastema decreased with age.

Eruption of maxillary lateral incisors and canines

The prevalence of midline diastema declined after maxillary lateral incisors erupted. Before the eruption of lateral incisors, the prevalence of midline diastema was 60.4% among all children, while it decreased to 25.4% after the lateral incisors erupted. And this prevalence was further decreased to 14.5% after the eruption of maxillary canines (Fig. 4). The mean size of diastema was 1.85 mm for children with central incisors only, and 1.34 mm for children who had both central and lateral incisors. For the children who had canines, the mean size of diastema was 1.2 mm, indicating a significant reduction of diastema size with lateral and canine eruption (Fig. 5).

In the 7-year-old group, the average lateral incisor eruption rate was 22.5% and there was no significant difference between boys and girls. Among 8-year-old children, the average lateral incisor eruption rate was 68.2%. There was significant difference between girls and boys, at 80.5% vs. 58.1% respectively. Among the 9-year-old children, the boys had a lateral incisor eruption rate of 86.4% while the girls had a rate of 94.9% (Fig. 6).

In the 10-year-old group, the girls had a significantly higher canine eruption rate at 63.2% compared with only 30% for boys. By age 12, the boys had caught up; 12-year-old girls had only a slightly higher canine eruption rate than boys (94.6% vs. 91.1%, respectively), and the combined average was 92.9% (Fig. 7).

Discussion

This study shows that the prevalence of maxillary midline diastema decreased with age. There was likewise a trend toward a decrease in the mean size of midline diastema with age. But even among 12-year-olds, 14.3% still had midline diastema. Gardiner6 examined 1000 British children and found that 46% of them had diastema at age 6, 33% at age 9, 18% at age 12, and 12% at age 13. In our sample population in Taiwan, the prevalence of midline diastema among 6-year-old children (64.6%) was higher than that in
Gardiner’s study and lower than theirs among 12-year-olds (14.3%; Table 1).

From the ages of 9 to 12 years, boys had a significantly higher prevalence of diastema than girls. We believe the reason why boys tend to have higher prevalence of maxillary midline diastema is because they have slower tooth development and later eruption of lateral incisors and canines (Figs. 6 and 7). Slower tooth eruption resulted in slower diastema closure. Richardson and colleagues found females had a higher prevalence of midline diastema than males at age 6, in USA children and the rates reversed by age 14 when males had a greater prevalence than females. In our study the prevalence of midline diastema in girls was higher than in boys only at ages 7 and 8, from ages 9 to 12, boys had higher prevalence of diastema. There was significant difference between boys and girls at ages 9 and 12. These findings are similar to the results of Richardson’s study.

Sanin’s study in Oregon, USA showed that diastema was present in 20% of cases after eruption of the permanent canine. In 36% of the children, closure of the diastema occurred during the clinical eruption of the lateral incisors, and for another 31%, it occurred during clinical eruption of the canines. Lindsey found that among children who only had eruption of the central incisors, 67.9% had a midline diastema. Among those with eruption of both the central and lateral incisors, the percentage decreased to 40.3%, and further decreased to 27.5% when all the maxillary anterior teeth were present. In our study, diastema was present in 14.5% of the children after eruption of the permanent canines, which is lower than the rate found in Sanine’s and Lindsey’s studies in Tennessee, USA.

A study by Richardson showed that at age 12, Caucasians had a diastema rate of 18.6% and Africans had a rate of 24.6%. Horowitz11 studied comparable populations of 10- with 12-year-old black and white children and found that 19% of the black children exhibited a midline diastema compared with only 8% of the white children. In our study, 14.3% of children had diastema. It indicated that Taiwanese children had lower prevalence of diastema than Africans. In the study done by Levelle et al, which also showed a higher prevalence of diastema in Africans than in Caucasians and Asian.

The sample population in this study was selected from a private elementary school located in Taichung City (the largest city in central Taiwan). All the students in this school were included in the study, and they were from different locations throughout the city. This sample group effectively represents the child population of central...
Taiwan. However, the children from central Taiwan may not represent the child population of Taiwan as a whole, though they may be closely correlated.

The decrease of maxillary midline diastema follows age progression and the eruption of lateral incisor and canine. After complete maxillary canine eruption, the percentage of boys and girls with midline diastema was 14.5%. This finding indicated that some midline diastema did not automatically close with age and tooth eruption; these may require further orthodontic care. Most importantly, closing the maxillary diastema orthodontically should be delayed until canine eruption.

The prevalence of maxillary midline diastema decreases with age. At age 12, the prevalence of diastema was 14.3% among children in central Taiwan. The prevalence and size of diastema also decreased with lateral incisor and canine eruption. The closure of diastema in girls is earlier than boys, therefore sex difference should be also taken into consideration when doing orthodontic treatment.

References