

Correction and Closing of the Midline Diastema in Children

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Abstract

A mismatch in tooth and jaw size in children can lead to midline diastema. Its incidence varies greatly in age groups. Multiple factors may contribute to the formation of midline diastema which including wrong oral habits, dental or skeletal anomalies, physical barriers, and soft tissue disharmony. In additions, some other factors such as genetic, normal dento-alveolar can play roles. Closure of diastema and spaces can be accomplished by orthodontic movement or by restorations. Any orthodontic movement is unlikely to be stable over long periods of time and some degree of retention, using either a removable appliance for night-time wear or a fixed wire retainer is inevitable.

Keywords: *Diastema; Oral Habit; Orthodontic Movement; Dental or Skeletal Anomalies; Physical Barriers; Dento-Alveolar; Soft Tissue Disharmony*

Introduction

Children's teeth often cause a lot of parents' anxiety because they first come out of the gums with abnormal angles and then change the positions and they are in the right position again. Second, the teeth erupt away from each other which might make parents be worried too much. The distance between the teeth of a baby does not necessarily mean that he will need a lot of dental treatments in the years to come. Midline diastema is very common in children in the early stages of dental development [1].

These distances are natural and make enough space for the eruption of permanent teeth, which are larger. However, the distance between permanent teeth, which is said to be "Diastema" in dentistry, can cause problems. The distance between the teeth may be due to tooth loss, genetic background, large labial frenum, supernumerary teeth, and crowded teeth, the discrepancy of jaws and teeth size and tooth eruption. Secondary factors include conditions such as overjet or tooth extrusion [2,3]. Hence, if parents notice that there is a gap between the child's permanent teeth, they should discuss the issue with a pediatric or orthodontic to eliminate the teeth gap.

Dentists can diagnose, treat and even prevent the problems of teeth and jaw alignment, including interdental distances. The dentist will talk with parents about their child's treatment options. The interdental distances are generally treated by a frenectomy, composite restoration, or orthodontic treatment. The orthodontist will recognize if the child needs a treatment or not, and in case of the necessity for orthodontic treatment, he will tell parents what the best time to start is.

What is diastema?

In Greek, it means an interval [4,5]. In other words, it is a space between two adjacent teeth in the same dental arch. Diastema is an excessive gap between the two teeth, especially central incisors. It is a very common problem among children which mostly observed in 6-year-old children [6]. Diastema is usually a natural part of the child's growth process and may be self-corrected. In fact, the majority of children have this problem, which by increasing age; these spaces will be closed naturally. If after the eruption of permanent teeth, there is still a diastema, it will become a chronic problem, and can only be corrected by dental treatments.

Causing factors

The interdental spaces can be due to several factors, some of which are in the control of the child, and some others are not. The space can occur either as a transient malocclusion or created by developmental, pathological or iatrogenic factors [2,7-10].

Familial background: A few reports show that hereditary factor may be one of the causes. Authors like Gardiner [11] and Schmitt, *et al.* [12] suggested that genetics could be a cause for midline diastema. Gardiner about the etiology of the midline diastema mentions that there is "almost no limitation concerning contributing factors. Undoubtedly, hereditary causes are high up the list and we have all seen parents and offspring with this feature" [11].

Wrong habits: Some habits, such as sucking a finger, can cause a gap between the teeth. Because such a habit put pressures on the anterior teeth and move them forward, therefore, creates spaces between them [13].

Pressure by tongue: Continuous contact of the tongue or tongue thrusting to the behind of the central mandibular teeth can also make teeth move to the forward leads to mandibular diastema [14].

Natural growth process: Usually, the teeth are separated at the beginning of the eruption. Moyers study showed that midline diastema was observed as part of normal growth (23.2%) among 82 patients [15]. But often, the eruption of Canine teeth results in the closure of the spaces [16].

Congenital absence of a tooth: Some children have congenitally one or two missing teeth (primary or permanent) in their jawbones, which results in a gap between the teeth. Often, these teeth are the lateral incisors that do not grow. Maxillary lateral incisor is the most common congenitally missing permanent tooth in the maxillary anterior region [2,3,17,18].

In another study, the most common etiology reported in the literature is tooth size or jaw size discrepancy including missing lateral incisors [19].

Tooth extraction: Sometimes there are extra or even impacted teeth in the jawbone prevent the eruption of the other teeth, hence, causes teeth to be apart. On the other hand, extraction of these extra teeth can also create a space. Oesterle and Shellhart mentioned that one of the causes of the presence of spaces in the dental arches may be the result of loss or absence of teeth [10].

Small teeth: Sometimes small and tiny primary teeth or having a big jaw can also lead to inconsistency in the teeth, and to create a gap between them [2,7,8,10].

Jaw magnitude: Some children's jaws are large in size compared to their teeth size. In other words, large maxillary arch size or bony defects could be the result of tooth-size arch length discrepancies. These abnormalities of maxillary arch structures include the following: Open suture, excessive skeletal growth, loss of bone support and so on [2]. As a result, the eruption and then the overall arrangement of the primary teeth in such a large jaw will be so that causes the creation of unwanted space.

Lingual frenum: This connects the tongue to the floor of the mouth. In some cases, the node of the tongue (a condition in which the tip of the tongue cannot get ahead of the lips due to the small size of the frenum) causes a gap between the lower anterior teeth and resulting in inhibition of free movement of the tongue [20].

Labial frenum: It lies in the midline of the upper and lower lip and attaches to the gum. The bulkiness or short attachment of frenulum increase the incidence of diastema in upper and lower anterior incisors. The studies showed frenum as a positive and negative factor responsible for midline diastema [21-24].

The space closure

Most of the time, the distance between the upper teeth closes by itself. Some believe that the maxillary midline diastema in growing children is the “ugly duckling” stage of dental development which is considered as a transitional stage. Hence, the closure of this diastema will happen after the complete eruption of lateral incisors and canines [2,8,11,13,25-27].

Of course, in some cases, the frenum is shortened at the age of one, and with the eruption of more teeth, the closure of the teeth extends further. Also, if the permanent teeth have space, the eruptions of posterior teeth bring them closer to each other by forcing on the anterior teeth.

Treatment

The type of diastema treatment (excessive distance between two teeth) depends on its causes. For midline diastema correction, we bring a number of treatment modalities which have been cited in the literature [7,8,28]. In some cases, the veneer or composite of the teeth can cover the distance between the teeth.

Frenectomy: Sometimes abnormal frenum attachment may require removal before orthodontic treatment. A case report indicated that in young children, the removal of large frenulum by surgery could lead to self-closure with no necessity for an orthodontic treatment at a later stage [29].

But other think that performing a frenectomy as a treatment plan for diastema closure at a young age and removing the interdental fibers may cause scar tissue formation which may lead to prevent the diastema closure. Therefore, orthodontic approaches should be considered prior to a frenectomy [30-33].

Naini and Gill believe “frenectomy is almost always contraindicated prior to orthodontic treatment. When a frenectomy is indicated, the timing should be agreed between the orthodontist and surgeon” [34].

Fixed auxiliary devices: After the age of 18, the dentists prefer the treatment options of fixed orthodontic therapy and restorative dentistry [35]. In older children, the braces are sometimes required to bring teeth closer to each other. In cases where the braces are needed to correct the gap between the teeth, even if space exists only in one jaw, complete braces (up and down) should be installed for him as the movement of one or more teeth affects on all the other teeth.

Braces are fitted on the teeth with the help of wire and elastics parts and make teeth get close together. In most cases, in order to correct the problem (excessive distance between two teeth), a complete set of dental braces and the use of space maintainers are needed, since the movement of one tooth affects the position of other teeth.

Removable auxiliary device: This device helps to eliminate the spaces between the teeth and get closer to each other. Due to normal growth and development and habits in children, most orthodontists prefer to correct the midline diastema as early during mixed dentition period by removable appliances [35] rather than the other treatments such as fixed orthodontic, restorative or even frenectomy.

Removable dental braces: For less severe cases, use of less aggressive therapies such as Invisalign (invisible orthodontics) has a good prognosis. In two decades, the Invisalign is introduced merely for adults. In other words, the patients who want to be treated by this system should have fully erupted permanent teeth. Hence, it is not an appropriate treatment for mixed dentition. Of course, adolescents with fully erupted permanent teeth can be selected for this treatment.

The Invisalign System offers several advantages over conventional fixed appliances: First of all, they are clear so that looks like more esthetically and acceptable for adults and young people. Second, aligners are generally more comfortable to wear; therefore, it can be removed any time, allowing having better oral hygiene [36-38].

Replacement of the missing teeth: There are different treatment alternatives for children with missing teeth. If the diastema is caused by the loss of a tooth, it can be filled with a composite bridge, dental implant (implants are only viable after a child has concluded the growth phase of adolescence) or removable partial denture, then the problem will be corrected [39,40].

Jofréan and Werner showed that there is a potential risk involved in placing implants in growing patients (even when using mini dental implants) [41]. Alternative approaches should be considered by the dentist in case of missing teeth in children.

Prevention

The healthy primary teeth keep permanent teeth in place. Having severe problems with deciduous teeth increases the risk of permanent teeth spacing. Elimination of the sucking habit and other destructive habits which can move the teeth will result in with no further requirements for future orthodontic treatments to close the spaces. According to the American Association of Orthodontics, all children should have their first orthodontic check-up by age of seven [42] to identify the possible problems so that reduces the amount of treatment might be needed.

Consequences

In most cases, interdental intervals are not harmful (not problematic) and do not interfere with chewing or eating food. However, sometimes sever diastema (having too much space between anterior teeth, especially the central incisors) will disrupt the speech, and make the pronunciation of "S" difficult [43].

In some cases, the distances are getting worse due to habits such as sucking a finger [4,5,15,19] or even tongue's pressure [23,26]. The adverse effect of finger sucking bears an impact on child dentition and occlusion [13,44-46]. However, if the presence of these disturbances has caused discomfort for the child, the habit that caused this problem should be stopped before the treatment begins.

Noting that any dental spaces might not be normal, it is better to check that by the pediatric dentists or orthodontists, because sometimes the presence of distance between the teeth can be an indication for a specific disease. For example, the presence of a gap may indicate a Mesiodens [19,47-49] or impacted tooth such as maxillary canines that ultimately leads to a lack of buds of permanent teeth which requires treatment and intervention.

Of course, the spaces between the teeth can be rare as a result of a series of tumors [9] which require the need for early intervention and urgent dental treatments [50].

Conclusion

In most children, the interdental space in maxillary anterior teeth is a common characteristic. This might make parents be worried about this condition and consequently, look for appropriate dental treatment. Hence, a diligent routine dental visit should be appointed in order to prevent possible dental problems.

The etiologic factors include environmental and genetic factors that all dentists should be taken into consideration. Before starting the treatments, the correct diagnosis is necessary to be approached. Treatment of diastema depend on the causes might be different for each individual. It may vary from esthetic approach to orthodontic approach.

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