

Interceptive Orthodontic Treatment: Efficient Early Correction of Malocclusions

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Introduction

When deciding on a treatment protocol for young children (7- 8 years old) with newly erupted crooked teeth, a dentist faces questions such as whether treatment should be recommended or not, and if orthodontic treatment is recommended, what technical protocol should be suggested to the concerned parents of a young child?

Social aspects should be considered when evaluating the timing of orthodontic treatment. By age 8, children's criteria for attractiveness are the same as those of adults, and the appearance of the smile is considered to be an important criterion when judging facial attractiveness [1]. Thus, interceptive treatment, such as the correction of jaw deformities and dental irregularities, can help raise a young child's self-esteem.

While there are some who question the benefits of interceptive treatment [2-6], there are others who have argued in favor of some form of intervention. A survey by College of Diplomates of the American Board of Orthodontics (CDABO) shows that a majority of the ABO diplomats value interceptive orthodontics and are actively involved in some sort of mixed dentition treatment [7]. One thing that is clear is there has been minimal progress in the development of appliances and techniques that can efficiently move young children's teeth [8]. Functional appliances used alone or in combination with fixed appliances have not produced predictable results quickly [9, 10].

This paper is intended for dental and orthodontic professionals, and it presents new approaches that use deciduous molars and canines as anchors to accelerate treatment of many mixed dentition cases such as: anterior crowding, open bite, overbite, and crossbite.

Correcting Crowding: Creating Space through Expansion

The primary way to create space in the mixed dentition protocol proposed in this paper is through expansion of the transverse dimension. The recommended period to begin this protocol is at 7-8 years of age. This coincides with the eruption of the permanent first molars and permanent incisors during the early mixed dentition period. One of the key benefits of this early expansion is a reduction in the need to remove deciduous teeth in grade school children and permanent teeth in middle school and high school children.

The protocol follows McNamara's method [11], with some changes to make it more practical. These changes include avoiding occlusal coverage for the maxillary expander and using fixed expansion in the mandible instead of a removable Schwarz.

Early expansion of the maxilla is a stable and effective way to correct arch length deficiencies [12-15]. Conversely, the effectiveness of expansion in the mandibular arch has been disputed [16-20]. Disagreement with regard to the effectiveness of the mandibular arch expansion may be related to the differences in the timing of treatment or the methods being used.

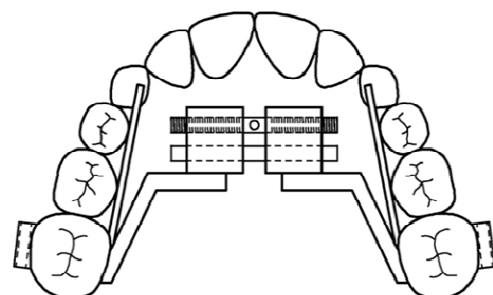
The expansion appliances used in this protocol for the maxillary and the mandibular arches take advantage of different growth mechanisms in the corresponding jawbones. In the maxilla, the increase in the transverse dimension is accomplished through skeletal expansion at the intermaxillary suture. In the mandible, dentoalveolar expansion of the buccal segments is used to increase the arch width.

Maxillary Expansion

Expansion of the maxilla is achieved with a 2-banded maxillary expansion appliance (MEA) attached to the first permanent molars. This produces expansion of the maxilla equivalent to the more traditional 4-banded appliance [21,22].

A 12mm expansion screw * is used with additional 0.036" arms extending from the first permanent molars mesially to the deciduous canines on the palatal side (Figure 1). The appliance is activated once a day until the palatal cusps of the maxillary posterior teeth touch the buccal cusps of the mandibular posterior teeth. In the maxillary arch, deciduous molars and canines are expanded simultaneously with the permanent molars by the MEA arms.

The maxillary deciduous canines are ideal anchors for crowded maxillary incisors



* (Dentaurum, Ispringen, Germany)

Figure 1. Maxillary Expansion Appliance prior to activation

because they are close to the permanent incisors. Premolar brackets are used on the deciduous canines because they adapt to their buccal surface better than other brackets [23]. Deciduous canines are bonded at the same time as the permanent maxillary incisors. Resilient arch wires align the incisors and move them together. The space developed in the midline is transferred distally to the lateral incisor and canine areas (Figure 2).

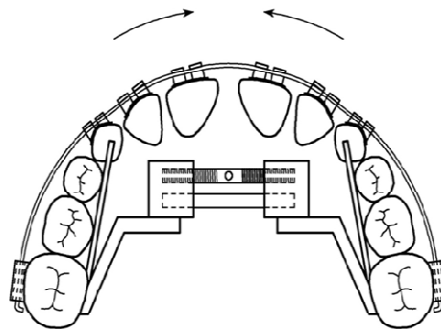


Figure 2. Closure of anterior spaces after activation of Maxillary Expansion Appliance

Once the desired amount of expansion is achieved, the MEA is left in place for two months to allow for skeletal stability. A benefit of this early expansion is a reduction in the incidence of impaction for maxillary permanent canines [24]. Figure 3A shows an upper left canine at risk of impaction before expansion. Figure 3B depicts the canine following expansion, with adequate space to erupt.

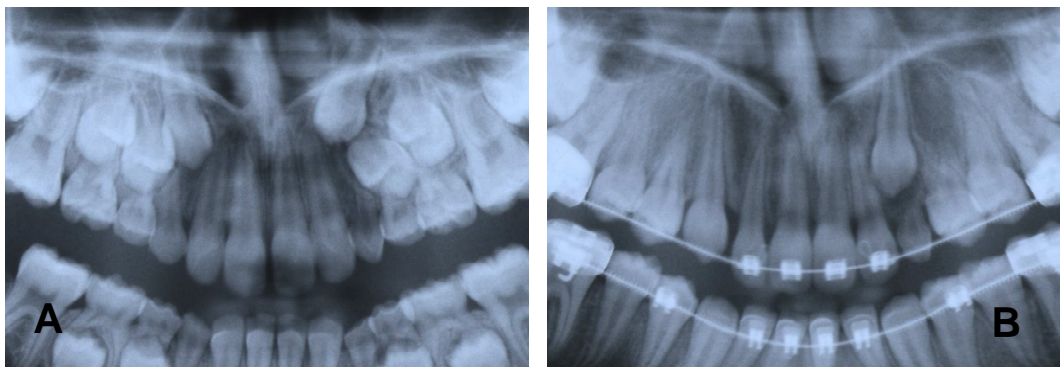


Figure 3. Creating adequate space for proper canine eruption

Mandibular Expansion

Step 1 – Expand the mandibular permanent molars. A removable 0.030” lingual arch,** inserted into the horizontal lingual sheaths of the mandibular permanent first molars, expands these teeth. The appliance does not touch the deciduous teeth of the buccal segments and lies passively against the lingual surfaces of the permanent incisors (Figure 4). The lower lingual arch (LLA) is removed and activated approximately every four weeks by adding expansion and buccal crown torque to the doubled-over distal ends, and then it is reinserted. Activation of the lingual arch is repeated until the mandibular permanent first molars establish a normal buccal-lingual relationship with their maxillary counterparts.

Step 2 - Expand the mandibular deciduous molars and canines.

In the mandibular arch, all the deciduous molars and deciduous canines are bonded along with the permanent incisors. Again, premolar brackets are used for the deciduous molars and canines. Resilient arch wires are used to move the deciduous molars and canines buccally to the expanded position of the permanent molars (Figure 5).

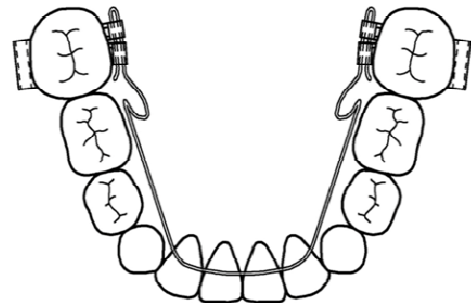


Figure 4. Mandibular lingual arch prior to activation

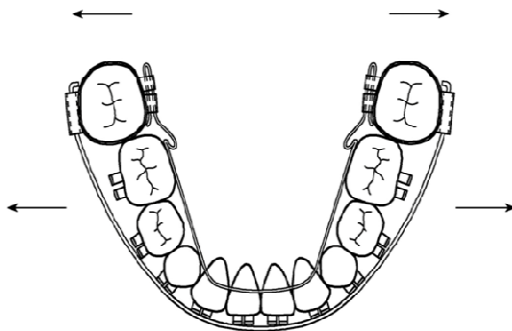


Figure 5. Expansion of mandibular deciduous molars and canines using expanded permanent molars as anchors

Expanding the mandibular buccal segments reestablishes arch coordination with the upper posterior teeth. It also creates space for the alignment of the permanent incisors by increasing the arch width.

** (3M Unitek, Monrovia, CA)

This additional arch space eliminates the need for extraction of the deciduous canines or deciduous first molars when aligning the permanent incisors. Furthermore, expansion of the mandibular deciduous molars and canines can enhance appositional growth of the buccal alveolar surfaces [25]. The resulting appositional growth of the alveolar bone potentially improves the environment for the periodontal support system of the developing permanent canines and premolars.

Expanding the mandibular buccal segments allows for further expansion of the maxilla [26]. This is often required in cases of severe crowding.

Correcting Open Bite and Overbite

Deciduous teeth can provide temporary anchorage to jump-start extrusion or intrusion of the incisors in cases where open bite or overbite is caused by under- or over-eruption of the permanent incisors. This is accomplished by changing the angle of brackets when bonding the deciduous teeth, producing extrusive or intrusive forces on the permanent incisors (Figure 6). These angle changes are called E-I tips, where E stands for extrusion and I for intrusion.

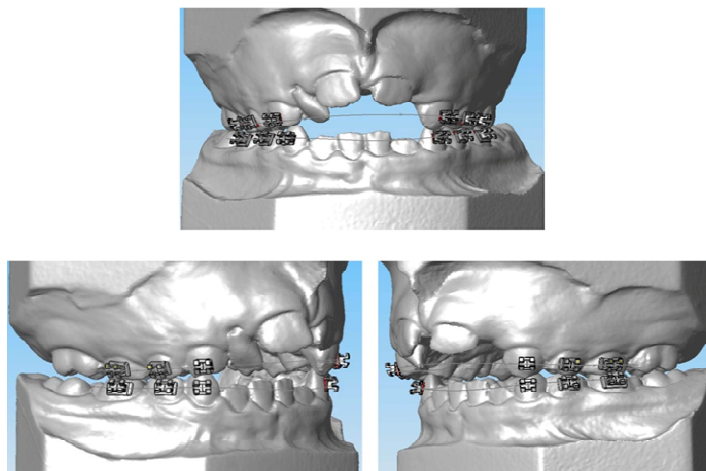


Figure 6. Position of deciduous brackets determines the position of permanent incisors

In the maxillary arch, the deciduous canines provide anchorage for extrusion or intrusion of the permanent incisors. Maxillary deciduous canines are usually the last deciduous teeth to exfoliate and they maintain adequate root lengths until late mixed dentition. They are also close to the permanent incisors, providing mechanical efficiency for extrusion or intrusion of the incisors. Maxillary deciduous first or second molars can be used if the deciduous canines are missing or loose.

To elicit extrusion, the mesial wing of the canine bracket is tipped incisally. Conversely, it is tipped gingivally to cause intrusion of the permanent incisors (Figures 7, 8).

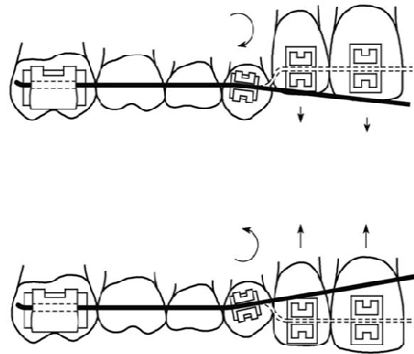


Figure 7. E-I tips of the maxillary deciduous canine brackets for extrusion or intrusion of permanent incisors

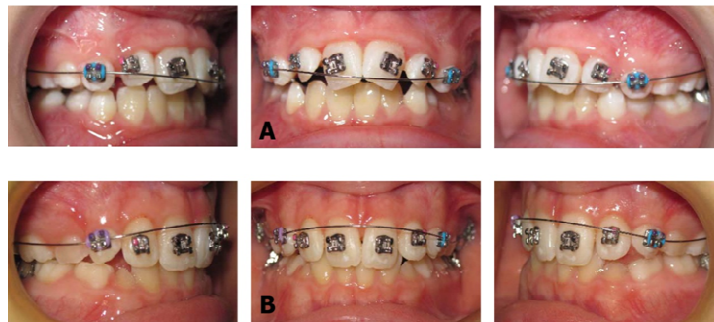


Figure 8. E-I tips applied to deciduous canine brackets for extrusion (A) or intrusion (B) of maxillary permanent incisors

In the mandibular arch, the deciduous molars and deciduous canines are used for extrusion or intrusion of the permanent incisors. The mandibular deciduous canines exfoliate earlier than the deciduous molars and do not have enough root length to serve as anchors by themselves. Using the mandibular deciduous molars and canines together for anchorage provides support for extrusion or intrusion of the permanent incisors. Gradual upward or downward sloping of the deciduous molars and deciduous canine brackets provides the E-I tips in the mandibular arch. Extending mesially from first permanent molars, the brackets are bonded with a more occlusal or gingival angulation. Deciduous second molar brackets receive a minimal tip while the deciduous canine brackets receive a maximum tip.

An upward slope of the buccal segment brackets extending from distal to mesial results in extrusion, while a downward slope causes intrusion of the permanent incisors (Figure 9).

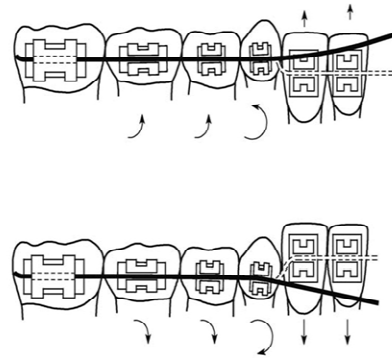


Figure 9. E-I tips of the mandibular deciduous brackets for extrusion or intrusion of permanent incisors

Accelerated extrusion of the incisors helps correct open bites related to sucking habits and tongue posture problems (Figure 10).



Figure 10. Bonded brackets on maxillary deciduous canines for accelerated extrusion of permanent incisors

Likewise, early intrusion of permanent incisors eliminates the need for bite turbos^{***} when treating overbites (Figure11).



Figure 11. Accelerated opening of the bite by using deciduous teeth as anchors

Bonding of brackets on the mandibular deciduous molars and canines allows for expansion of the buccal deciduous teeth and for extrusion and intrusion of the permanent incisors. When deciduous teeth are used as anchors, only round arch wires are used. Arch wire selection is based on the incisor irregularity, starting with the more elastic variety and ending with 0.018” stainless steel.

^{***} Bite turbo: a small acrylic block that is bonded on the lingual surfaces of the maxillary anterior teeth or the occlusal surfaces of the posterior teeth to temporarily open the bite and facilitate movement of teeth.

Correcting Anterior Crossbite

Correcting anterior crossbite is desirable during the early mixed dentition period. Bonding deciduous teeth adjacent to the permanent teeth that are locked in crossbite increases the mechanical efficiency of the appliances (Figure 12).



Figure 12. Bonding deciduous teeth adds efficiency in correction of anterior crossbite

Using I-tips for early intrusion of the mandibular permanent incisors eliminates the interference with the maxillary permanent incisors. This eliminates the need for bite turbos when correcting an anterior crossbite.

Debonding of Deciduous Brackets

Deciduous teeth are used as anchors for a relatively short period. Deciduous teeth brackets are removed once a rigid rectangular arch wire, such as .017"X.022", can be engaged in the incisor region.

A maxillary expansion appliance and a lower lingual arch are generally used for less than six months. Once the expansion is completed and permanent the incisors are well aligned, the MEA and LLA can be removed.

At this point, a heavy rectangular arch wire (2X4 appliance) stabilizes the expansion and improves the buccal-lingual angulation (torque) of the permanent molars and incisors.

Auxiliary Mechanics

The flexibility of the fixed appliance system allows intermaxillary elastics to be incorporated (Figure 13). Various orthopedic appliances such as headgear, facemask, Herbst, and chin cup can be used to correct skeletal discrepancies.

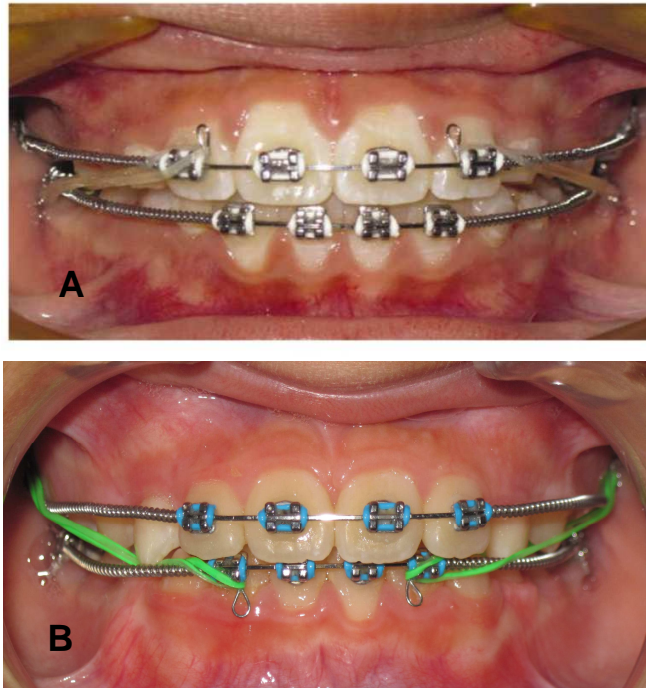


Figure 13. Using intermaxillary elastics, Class II (A) or Class III (B) during 2x4 stage

Conclusion

Creating a normal occlusal relationship and a balanced neuromuscular environment at an early age can help the normal growth of the facial skeleton in an otherwise healthy child [27]. Although some debate still exists regarding interceptive orthodontics, early treatment is advantageous in correcting certain forms of malocclusion such as crowding, overbite, open bite, and crossbite [28-32].

The mixed dentition protocol presented in this paper uses expansion in the transverse dimension as the primary method to create space. An MEA device is used to expand the maxilla. Early expansion of the maxillary skeletal complex in non-crossbite individuals can correct maxillary arch length deficiencies [11, 14]. Using maxillary deciduous canines as anchorage helps align the maxillary permanent incisors. In the mandible, expansion of the buccal segments, including deciduous molars and canines, can increase the arch width to accommodate crowded permanent incisors.

The protocol uses E-I tips to carefully position the deciduous brackets and improve the mechanical efficiency of appliances to accelerate the correction of open bite, overbite, and crossbite conditions.

Benefits of the protocol include:

1. Accelerates treatment time
2. Reduces the occurrence of impaction of maxillary permanent canines
3. Eliminates the need to extract the deciduous canines or deciduous first molars
4. Reduces the need to remove permanent teeth
5. Raises a young child's self-esteem

To get more information about mixed dentition orthodontics and to participate in an open discussion about the subject, please visit www.interceptiveortho.com.

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