CASE REPORT

Rapid Palatal Expansion and Utilization of E-space in Mixed Dentition: Mechanics that Helps in the Corrective Orthodontic Treatment

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Abstract

Aim and objective: The objective of this article was to report two clinical cases, showing the benefits of interceptive treatment using rapid palatal expansion (RPE) and the preservation of E-space.

Background: It is important to follow-up child throughout its development to detect irregularities in their occlusion and to avoid or attenuate orthodontic treatments in the future. Posterior crossbite and transverse maxillary deficiency can easily be corrected by RPE that enhances the width of the maxilla and promotes a gain of space in the arch. Another way to gain space in the arch is by using the E-space, which is the difference between the mesiodistal distance of the second primary molar in relation to the second premolar. This additional space can be used to resolve negative, mild, or moderate crowding.

Case descriptions: Two clinical cases that presented malocclusions due to lack of space and maxillary deficiency, along with clinical technic of how the RPE and E-space can be used to bring those patients back to normality.

Conclusion: We concluded that with a right diagnosis, correct interceptive timing, and using what growth provides, the development can be reestablished.

Clinical significance: The clinical importance of this report is that RPE and E-space are efficient interceptive orthodontic treatments to correct skeletal posterior crossbite (SPC) and gain space in dental arches.

Keywords: Corrective orthodontics, Interceptive orthodontics, Palatal expansion technique, Space maintenance.

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Introduction

Rapid palatal expansion (RPE) is an established method and highly used to correct the maxillary transverse deficiency and posterior crossbite in the primary and mixed dentition.[1] Those alterations may be caused by genetic factors, environmental factors, or both.[2,3] In the mixed dentition, RPE, besides correcting the transversal deficiency, promotes gain of the space in the arch, decreases buccal corridor, and increases maxillary width.[4] Another common problem in mixed dentition is the lower and upper crowding. Stripping, distalization, proclination, tooth extraction, and space supervision are some alternatives to gain space in the arches. One of the ways to do space supervision is using E-space, which is the difference between the mesiodistal distance of the second primary molar and the second premolar.[1,5] This additional space created by E-space can be used after de exfoliation of the second primary molar, playing important role in the crowding resolution and avoiding more complex orthodontic treatment in the permanent dentition. E-space can be harnessed by using a space maintainer appliance, like the lingual arch that prevents the mesial movement of the first permanent molars.[6–8] This article aimed to report two clinical cases who employed RPE and lingual arch to obtain space in the dental arches and minimize the corrective orthodontic treatment.

Case Descriptions

Case 1

An 8-year-old female patient, with a chief complaint of "crowded teeth". On extraoral examination (Fig. 1), she was having a convex profile, asymmetric face slightly increased lower third, and mesofacial pattern. Intraoral examination (Fig. 1) revealed that she was in the mixed dentition stage with Angle's class I in molars and canines. Anterior open bite (AOB), lingual interposition habit, skeletal posterior crossbite (SPC) on the left side with transverse maxillary deficiency. The upper midline was shifted 1.0 mm to the right and the lower midline was coincident with the facial midline, moderate to severe crowding on lower arch teeth (–5 mm) and upper arch (–3 mm) (Fig. 1). Her radiological exam (Fig. 2) revealed that all permanent second premolars were with the crown completely formed (Nolla stage 5) and developing between primary molars. The goals of the treatment were to correct the SPC, transverse maxillary deficiency (upper arch), and eliminate the negative osteodental discrepancy in the lower arch. Treatment plan

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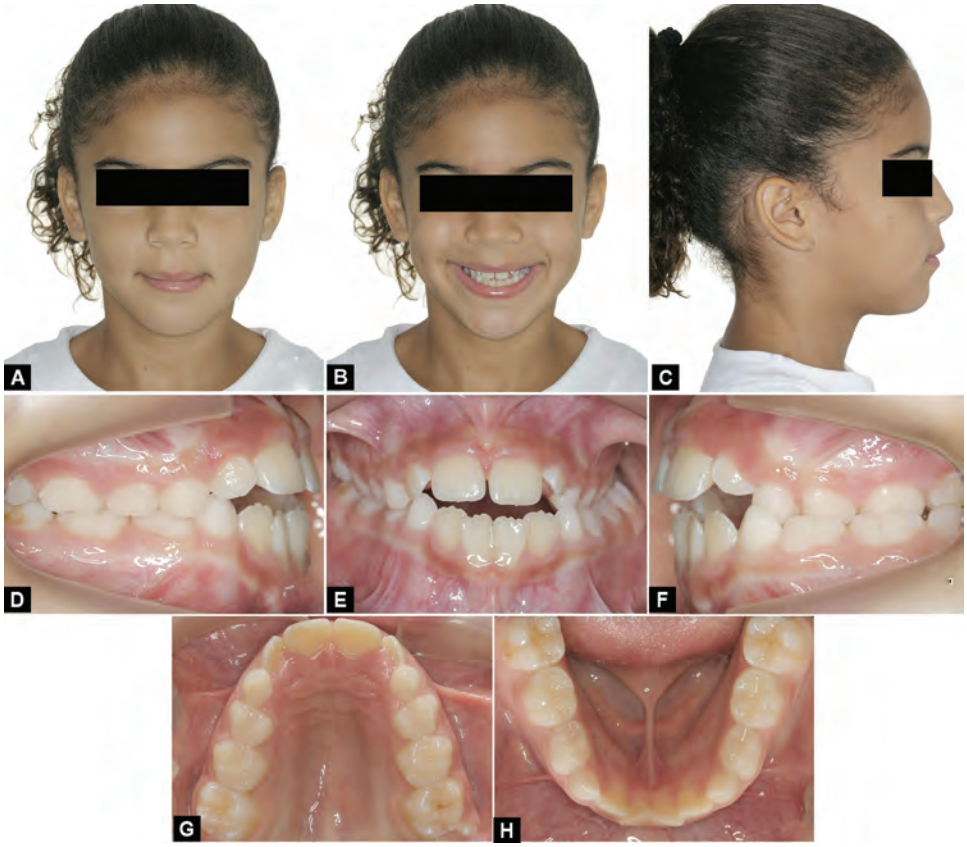
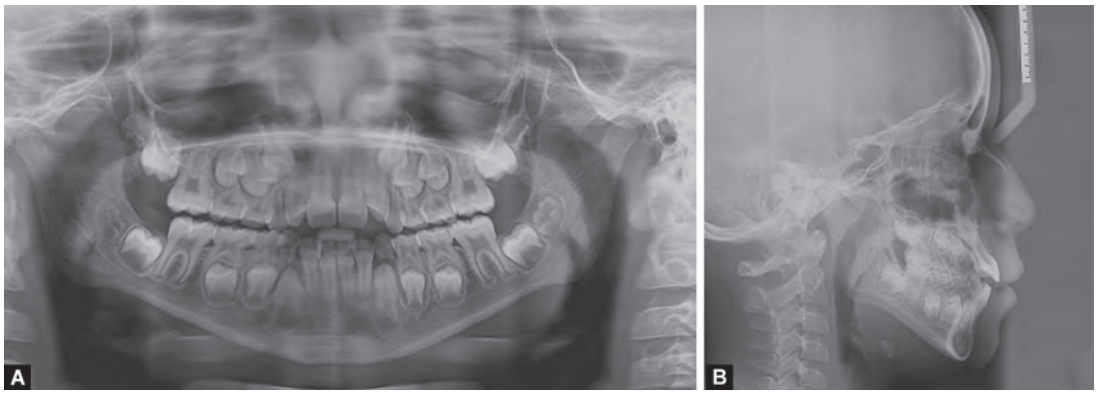


Figs 1A to H: (A to C) Extraoral photographs; (D to H) Intraoral photographs showing AOB (E), SCB (F) in left side, maxillary transverse deficiency (G); upper and lower crowding (G and H)

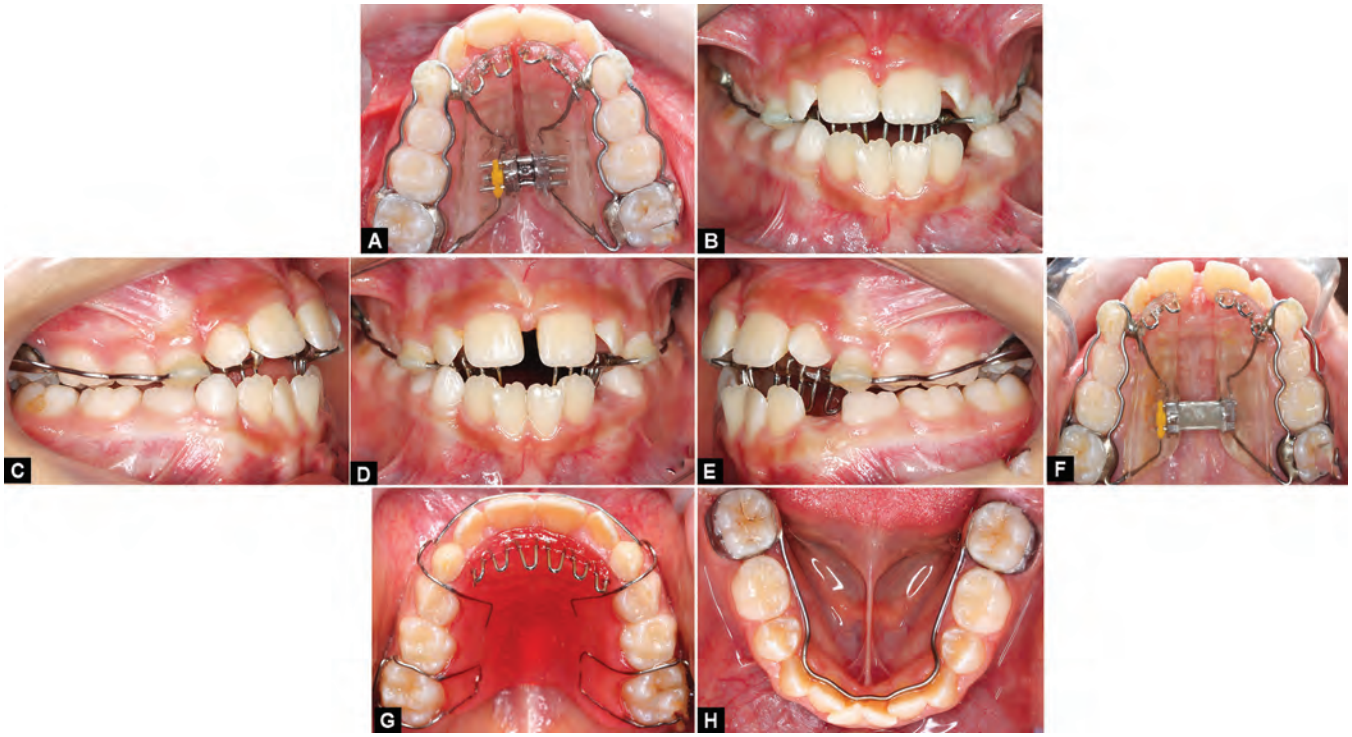


Figs 2A and B: Pretreatment panoramic and cephalometric radiography

on the upper arch consisted of RPE with HAAS expander modified with palatal vertical crib to correct SPC AOB (Fig. 3). After RPE, expander was maintained in the mouth for 6 months with retention. At the end of retention time, expander was removed and it was installed removable appliance with palatal crib in the maxilla to finish the AOB correction. The last appliance was used by 12 months. Lingual arch was placed next to exfoliation of the lower second primary molars to harness the E-space (Fig. 3). Treatment results were: SPC correction, AOB closure and overcorrection. At the lower arch, there was the harness of the E-space and improvement of the crowding (Fig. 4). Patient was evaluated until permanent dentition and soon after, it was installed an orthodontic corrective appliance for alignment, leveling, and finalization of the occlusion. By the end, the patient had good facial esthetics, stable, and adequate occlusion (Fig. 5).

Case 2

An 8-year-old male patient, with a chief complaint of "crooked teeth". On extraoral examination, the patient showed a symmetric face, convex profile, and mesofacial pattern (Fig. 6). Intraoral examination revealed that the patient was in the inter-transitory stage dentition, Angle's II class, 1ª division, right subdivision, canines were in Angle's class II on the right side and class I on the left side. Right SPC, midlines deviated, severe overbite, 4 mm overjet, diastemas between superior incisors, and mild lack of space on the lower arch (–3 mm) (Fig. 6). His radiological exam revealed



Figs 3A to H: (A and B) Haas expander with palatal vertical crib before expansion; (C to F) Fifteen days of activation there were SCP overcorrection, diastema aperture between upper incisors and increase of maxillary width; (G) Removable appliance with vertical palatal crib installed after expander removed; (H) Lingual arch

Figs 4A to H: Patient after interceptive orthodontic treatment. (A to C) Extraoral photographs; (D to H) Intraoral photographs showing SCP and AOB correction and improvement of lower crowding

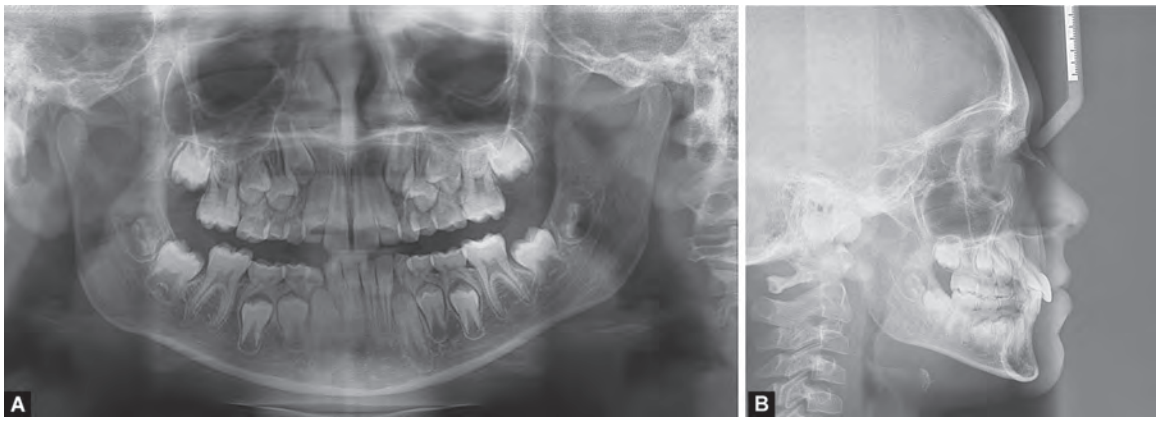
Figs 5A to H: Extraoral (A to C) and intraoral (D to H) photographs after corrective orthodontic treatment

Figs 6A to H: (A to C) Extraoral photographs; (D to H) Intraoral photographs showing SCB in right side (D); maxillary transverse deficiency (G); mild lower crowding (G and H)

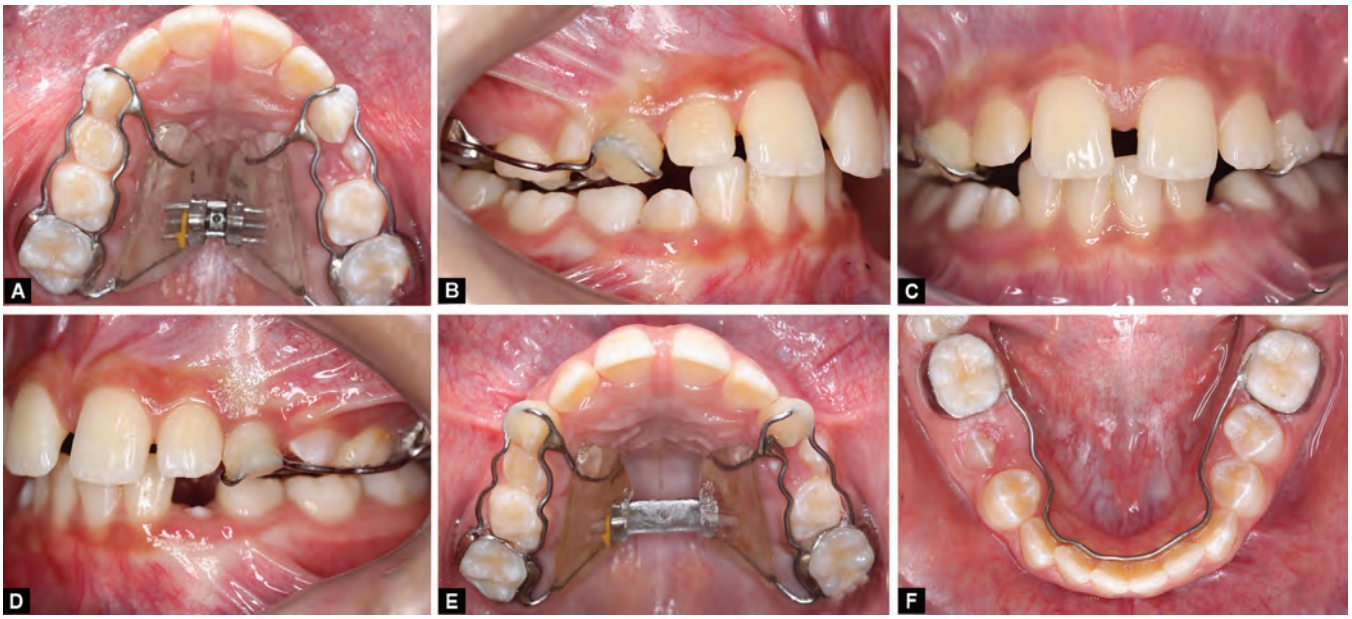
an advanced rhizolysis process in canines and primary first molars and ankylosis on the right lower second primary molar (Fig. 7). Treatment objectives were to correct the maxillary transverse deficiency and SPC, accelerate the right lower primary second molar rhizolysis and to gain space in the lower arch. Treatment plan was RPE, add composite on the occlusal of the right lower primary second molar to stimulate the rhizolysis process and to promote its exfoliation. Lingual arch was placed to harness the E-space (Fig. 8). On permanent dentition (Fig. 9), it was placed an orthodontic corrective appliance to finalize the treatment. At the end of the treatment, a harmonic smile, an appropriate occlusion, and good esthetics were achieved (Fig. 10).

Discussion

Orthodontic treatment can be initiated on the primary dentition, mixed, or permanent. However, when realized in childhood, it allows the correction of skeletal and dental problems with greater ease. Interceptive treatment's purpose is to correct or minimize the occlusal problems, and so, reduce or avoid the treatment time on the permanent dentition.[9] Transverse maxillary deficiency promotes disharmony between maxilla and mandible and normally, it cause SPC unilateral or bilateral. It can be associated with some characteristics, such as respiratory disorders, dental crowding, and buccal corridor increase.[10] Rapid palatal expansion is an efficient procedure to correct SPC and to obtain apace on the dental arch. Difficulties for its execution increase with age due to sutural obliteration that provides significant skeletal resistance, mainly at the level of the zygomaticomaxillary and front maxillary suture, which justify the procedure at such a young age.[11] Therefore, as young the patient is, the better the results will be.[12] Rapid palatal expansion presents skeletal effects, but also dental alterations which decrease the procedure rate of success. When adequately executed, it also promotes a gain of space in the dental arch (on average 3 mm, approximately),[13] and for this reason, RPE was chosen for both cases presented. Many patients present SPC and AOB, which can be caused by countless etiologic factors. Different kinds of approaches may be proposed, still not existing a consensus regarding the best treatment.[14,15] On the first clinical report, to correct the dental AOB, it was placed a vertical palatal crib on the disjuncture and the removable appliance. Vertical cribs on both appliances contributed to preventing tongue



Figs 7A and B: Pretreatment panoramic and cephalometric radiography



Figs 8A to F: (A) Haas expander before expansion; (B to E) After expansion (18 days); (F) Lingual arch. Note e-space maintained in right side

Figs 9A to H: Extraoral (A to C) and intraoral (D to H) photographs after interceptive orthodontic treatment

Figs 10A to H: Extraoral (A to C) and intraoral (D to H) photographs after corrective orthodontic treatment

interposition. A full correction was finalized due to the child's collaboration on the use of the removable appliance, in the opposite direction the disadvantages described in the literature about such appliances.[15–18] Most of the negative osteodental discrepancies com 4.5 mm or below can be resolved by harnessing the E-space.[19] With this supervision, crowding in both cases was solved. Studies showed that the lingual arch placed in mixed dentition restricts the mesial movement of molar and provides the use of E-space by molars.[19,20] Reports presented confirm such affirmations because the lingual arch fulfilled its purpose, preserving the E-space. Treatments choose helped to reduce and avoid future orthodontic problems, by eliminating interferences on development and growth. The clinical cases presented, were used consecrated methods that corrected the malocclusions without having to perform any extractions, surgeries, great dental movements, or even prolonged corrective orthodontics. The orthodontic corrective appliance was necessary to do small corrections and improve alignment and leveling.

Conclusion

Most of the types of malocclusions can be intercepted or at least minimized when adequately corrected in mixed dentition. Treatments plans and accurate diagnoses are extremely important. With RPE and E-space, it was possible to provide a reestablishment of the normal process of growth and development and to mitigate the corrective orthodontic treatment.

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