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## Upper midline deviation: modified Hyrax expander

### ABSTRACT

**Background** The Hyrax rapid palatal expander is useful for patients in mixed dentition with premature exfoliation of some deciduous teeth and maxillary hypoplasia. This appliance, which is provided of a vestibular arm for correcting maxillary asymmetric transverse discrepancies, represents an interceptive treatment able to reduce the duration of the orthodontic therapy with fixed appliances.

**Case report** In this case report the modified version of the Hyrax rapid palatal expander is described. The activation method, the therapeutic benefits as well as the clinical advantages are described.

**Keywords** Hyrax rapid palatal expander; Midline deviation; Orthodontic treatment.

### Introduction

The expander with buccal arm represents an interceptive treatment able to reduce the duration of the orthodontic therapy with fixed appliances.

Premature loss of a primary canine presents a potential alignment problems because it can cause drifting of the lateral and central incisors toward the affected side. This situation can create a midline discrepancy and asymmetry within the arch, causing lack of adequate space for alignment and interferences with eruption, which can prevent the permanent tooth from erupting on a normal schedule, and secondarily can lead to space problems because other teeth drift to improper position [Andrews, 1980; Mc Namara, 2000].

It may also cause anterior crowding, which can be responsible for secondary crowding in the lower arch.

If no permanent teeth will be extracted to provide

additional space in the arch, this problem needs to be addressed before the remaining permanent teeth erupt.

The aim of this article is to describe a case report of a patient treated with the modified version of the Hyrax rapid palatal expander. This device was described by Farronato et al. [2009] for the treatment of patients in mixed dentition who, due to maxillary hypoplasia and premature exfoliation of some deciduous teeth, show a migration of permanent incisors with a reduction or closure of the space for the permanent teeth substituting those previously exfoliated [Farronato et al., 2000]. This case report describes the advantages of this modified version of the expander for correction of asymmetric deficiencies of the upper jaw.

### Appliance design

The appliance, in metal or pure titanium frame for nickel-allergic subjects, consists of the following.

1. Two bands for the first permanent molars or the second deciduous molars.
2. Two palatal arms welded to the bands extending to the mesial surfaces of the deciduous or permanent canines.
3. One central 9-mm jackscrew.
4. One buccal arm with a final loop extending from the molar band up to the buccal surface of the incisor contralateral to the deviation of the upper midline.

### Appliance preparation and application

1. Appropriate size molar bands are selected and placed in the mouth and an alginate impression is taken.
2. The impression, together with the inserted bands is sent to the laboratory which will assemble the appliance.

When the appliance is ready, it is placed in the oral cavity with the following procedure.

1. Separators should be positioned three days before the appliance is fitted.
2. Expander testing.
3. Etching and priming the buccal surface of the incisor where the buccal arm is applied.
4. Appliance cementation.
5. Application of a composite embedding the final loop of the buccal arm and bonding it to the incisor.
6. Check of the correct positioning and inclination of the palatal and buccal arms.
7. The expander is activated with a quarter of a turn twice a day (morning and evening) for fifteen days. The strength generated is about 2-3 kg in 0.5-mm activations. The expansion obtained is about 7.5 mm. The patients are visited once a week for two weeks. The appliance is then blocked with a metal ligature wire and is then kept passively in place for 4-6 months to wait for drifting of the incisors into the space created by the expansion and to stabilise the results. The protocol can be adapted to each case.

## Case report

An 8-year old boy, with unremarkable medical and dental history, came to our observation. The intraoral examination showed a midline deviation, dental Class I on both sides, loss of the upper left primary canine and shift of the permanent upper right incisors in the space left from the lost canine, palatal asymmetry and anterior hypoplasia (Fig. 1-4). The lateral cephalometric X-ray showed a Class I skeletal relationship.

It was decided to expand the upper jaw to obtain arch symmetry and create space for the correct eruption of the left permanent canine.

A modified Hyrax expander with buccal left arm was fabricated. The final loop of the buccal arm was embedded in a composite and bonded to the left central incisor (Fig. 5-6).

The expander was activated twice a day until the desired expansion was obtained. After one week of expansion it was possible to observe a large diastema between the two incisors. In the following months it was observed a closing of this space by shifting of the right central incisor, thus centering the midline and creating the space for the correct eruption of the right upper canine. A correct palatal arch form was also obtained.

The four-year follow-up allowed to underline the stability of the midline correction and the arch form (Fig. 7).



FIG. 1



FIG. 2



FIG. 3



FIG. 4

FIG. 1-4 Intraoral left, right, occlusal and frontal images at the beginning of treatment.

## Discussion

Symmetrical dental arches permit to achieve maximum intercuspation, functional occlusion, stability and a reduced potential for TMJ dysfunction.



FIG. 5

FIG. 5-6 Modified Hyrax expander with buccal arm.



FIG. 6



FIG. 7 Intraoral frontal image at the end of treatment.

The loss of one primary canine can cause drifting of the permanent incisors toward the affected side creating space problems and midline discrepancy. Usually a space maintainer is required, but this device alone is not adequate for the treatment of space deficiency. Lost space can be regained by repositioning the teeth that have drifted. An early intervention helps a lasting skeletal harmony and improves the maxillomandibular and occlusal relationship as well as the oral functions [Betts et al., 1995; Bjork et al., 1984; Farronato et al., 2007; Farronato et al., 2011; Farronato et al., 2011; Farronato et al., 2012; Farronato et al., 2012; Oktay et al., 2007; Proffit et al., 2004].

The modified Hyrax expander permits to obtain adequate transverse maxillary diameters and centering of the upper and lower midlines. Moreover the device permits to regain the space required for correct eruption of the following teeth, in the case of tooth shifting due to prematurely exfoliated teeth.

The use of this appliance allows to restore the correct transverse maxillary diameters, to regain space and at the same time to restore the symmetry of the midlines up to 5-6 mm. In addition, recovery of the arch length can be obtained, as demonstrated by the case reported.

## Conclusion

Maxillary deficit should be corrected as early as possible.

Increase of the arch length and improvement of the arch form will provide extra space which may then be concentrated in the canine area. The presence of a vestibular arm bonded to the contralateral incisor permits to favourably distribute the space obtained from the palatal expansion allowing incisors homolateral to the deviation to move and occupy the available space.

Eruption of the permanent canine homolateral to the deviation of the midline is favoured. This tooth can then erupt in the space created after arch expansion and migration of the incisors in their correct position.

The expander with buccal arm represents an interceptive treatment able to speed the orthodontic therapy with fixed appliances.

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