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## Cross-bite therapy during primary and mixed dentition.

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# Cross-bite therapy during primary and mixed dentition.

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## Abstract

Posterior cross-bite is a very frequent malocclusion on the transversal plane among the pediatric population. It is diagnosed when the buccal cusps of one or more maxillary teeth are placed lingual to the buccal cusps of the mandibular teeth. It can be unilateral or bilateral. Ferro shows that the prevalence of cross-bite was 3.7% in a sample of 1960 children during primary dentition with a slight prevalence of cross-bite in females, but with no overall statistical significance(1). The most frequent form is unilateral cross-bite caused by a symmetrical contraction of superior arch with a consequent mandibular shift.

The high frequency of cross bite is related to environmental factors able to influence the maxillary growth: correct breathing and swallowing patterns are necessary for a correct maxillary growth otherwise the superior arch isn't stimulated to grow in the correct way and a posterior cross-bite can occur (2).

The aim of this work is to investigate about treatment options for posterior cross-bite during childhood, in particular way describing features and use of Leaf Expander, a new expansion device.

## Introduction

Posterior cross-bite in pediatric population can be treated with lots of different appliances. It's important to underline the urgency of early treatment of unilateral cross-bite with mandibular shift because in growing patients this functional asymmetry can easily become structural (2) whereas, if a mandibular asymmetry is caused by a shift after the palate contraction, it disappears right after the maxillary expansion (2) (3) (4).

## Methods

It was realized a search on Pubmed and Scholar of studies, about the treatment of posterior cross-bite in pediatric population. Literature pertaining the management of posterior cross-bites in the primary and mixed dentition are reviewed.

## Discussion

The Rapid Palatal Expander (RPE) is a fixed appliance used in growing patient with symmetric palatal contraction. It uses orthopedic forces (more than 250gr) generated by a central screw to open the mid-palatal suture (4). It can only be used in patient whose mid-palatal suture is not fully ossified yet even though it can be difficult to understand it as the ossification age isn't the same in the whole population.

Another problem with this device is pain: many studies show how pain is almost always present during the use of RPE and that it's higher during the first days of activation (5).

RPE must be activated two times per day by the patients (with the help of another person): the orthodontist does not have the total control of expansion and compliance problems can occur.

Quad-helix is a fixed appliance producing a dento-alveolar effect used in adults and in children with a slightly lighter maxillary contraction (6) (7). Some studies show how dento-alveolar devices for cross-bite treatment can also have an orthopedic effect in young patients (8). Quad-Helix can be activated by the orthodontist into the mouth but, for a better control of the activation, it is preferable to de-cement the appliance and to activate it out of the patient's mouth.

The main benefits are the reduction of pain and the major control of expansion. The problems are related to the elongation of time on dental chair and the impossibility to correct serious contraction problems.

Leaf Expander is an oral device produced by Leone spa. It is an evolution of E.I.A.(Espansore Lento Ammortizzato), an appliance used to obtain a slow expansion mainly in adult patients (9). The main innovation from other expansion devices is a spring into the expansion screw.

Today E.I.A. is out of production because of its size problem: it is too big to be used with child's whose mouth dimension is often too small to fit this device. Moreover, in the E.I.A., the expansion spring isn't visible through the screw so it isn't possible to know how many spring's activations have been made (9).

The purpose of the Leaf Expander is to solve the E.I.A. problems (10)(11). As a result of this, it has the same design of the E.I.A. but a smaller size for a better fit also in smaller mouths. Another difference is the presence of two or three Nickel-Titanium crossbow springs producing a light and constant force. The screw is activated by the orthodontist and not by the patient as in Rapid Expanders.

These characteristics lead to the main benefits of the Leaf Expander: firstly, the expansion is less painful thanks to the use of lighter forces, secondly, there is a better control of the expansion as the orthodontist activate the expansion screw by himself.

The amount of expansion obtainable depends on:

- Number of springs: devices with two or three springs are available. Every active spring produces an expansion of 1.5mm: two springs produce 6mm of expansion (3 mm on each side) whereas three springs produce 9mm of expansion (4,5 mm on each side). In presence of a unilateral cross-bite it's better to choose a screw with two springs whereas, in case of a bilateral crossbite, a screw with three springs is definitely a better option.
- Spring's thickness defining the entity of the applied force: both 450 gr or 900 gr springs are available. The use of heavier forces (900gr) is recommended in adult patients, in case of deep bite and in presence of teeth grinding or clenching. Lighter forces are preferable in children, in presence of open bite, in patients with periodontal diseases and in presence of hypodontia or agenesis.

Every screw activation is equivalent of 0,1mm of expansion: the 6mm screw allows a maximum of thirty activations resulting in a maximum expansion achievable of six millimeter whereas the 9mm screw reaches 9 millimeter of expansion with forty-five activations. The first activation is made by the technician during the appliance fabrication and a metallic ligature is binded to compress the springs; this ligature is cut only after the appliance is placed in the patient mouth and the springs start to apply the expansion force.

The screw activations start after spring force is extinguished, usually two months after the appliance cementation. Activations are then made every month and the amount depends on the screws size: 10 activations per month using 6 millimeter screws, 15 activations per month with 9 millimeter screws.

Leaf expander has a gradual remodeling effect on the mid-palatal suture if it is used in young patients.

Another benefit of slow expansion is the possibility, for the mandibular arch, to adapt to the new condition.

During primary or mixed dentition, the expander bands can be fixed on primary molars to avoid damages of

permanent teeth roots. It's therefore necessary to know whether deciduous teeth are stable or not: a method uses the orthopantomography by drawing a line parallel to occlusal plane and passing through most occlusal cuspid of second premolar; if this line is placed apical to the pulp chamber of the first permanent molar it means that the second premolar is going to erupt between more than one year and so, the deciduous molar can be used for anchorage.

It's better to use the Leaf Expander when the central incisors and the first molars are erupted. Lateral incisor must be present after the expansion to stabilize the occlusion(9)(10).

## Conclusion(s)

Posterior cross-bite requires an early treatment and there are a lot of appliance that can be used to treat this malocclusion during the growing period. Every device has benefits and problems, so the orthodontist has to choose the suitable one for each patient, customizing the treatment.

Leaf expander is an excellent alternative to the classic expanders.

Its main benefits are:

- Less pain during the expansion;
- Gradual expansion that allows a great adaptability of lower arch at the new situation;
- Is a zero-compliance appliance so the expansion control is made by the orthodontist
- It can be used in young and adult patient and during mixed dentition deciduous molars can be used for anchorage with no risk of root resorptions.

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