

# Use of the Leaf Expander® in the treatment of adult transverse maxillary deficit: a case report

*Dr. Maria Elena Grecolini - Specialist in Orthodontics and Gnathology - Exclusive Freelancer*

*Dr. Alberto Casali - Specialist in Odontostomatology and Orthodontics - Exclusive Freelancer*

*Dr. Daniel Celli - Specialist in Odontostomatology and Orthodontics - Exclusive Freelancer*

*Odt. Gianluca Mele - Ortholab Dental Laboratory (LE)*

## INTRODUCTION

Rapid palatal expansion is a very common procedure for the correction of transverse maxillary reduction. The fusion of the median palatine suture is the decision term for the implementation of corrective treatment strategies.

<sup>(1)</sup> Although several studies have shown that this condition can be detectable in patients aged 15 to 19, there are others that show cases where at 27, 32, 54 and 71 years of age this is not detectable.<sup>(1,2,3)</sup>

<sup>(2,3,4)</sup> Assuming therefore that age is not a valid decision-making indicator, staging of vertebral maturity and the aid of CBCT imaging, at pubertal and post-pubertal age, can be considered the most reliable methodology.<sup>(5,6,7,8)</sup>

When skeletal disjunction is not feasible in its entirety or only partially, dento-alveolar expansion is the only result that can be achieved through the use of palatal disjunctors and has been reported as a result in 39-49% of cases and accounts for 6% to 13% of the total expansion.<sup>(10,11)</sup>

## SUMMARY CARE PLAN

The patient's adult age could not be disregarded when planning the treatment plan. The severe skeletal malocclusion was treated without a surgical approach and took into account the patient's explicit request to refrain from any intervention and/or dental avulsions.

The case presented an important unilateral cross with high grade upper and lower crowding, non-coincidence of the interincisive lines and asymmetrical molar and canine occlusion with Class I on the left and Class II on the right.

The transverse maxillary discrepancy was treated with the aid of a 900 g Leone Leaf Expander® (Fig. 1).

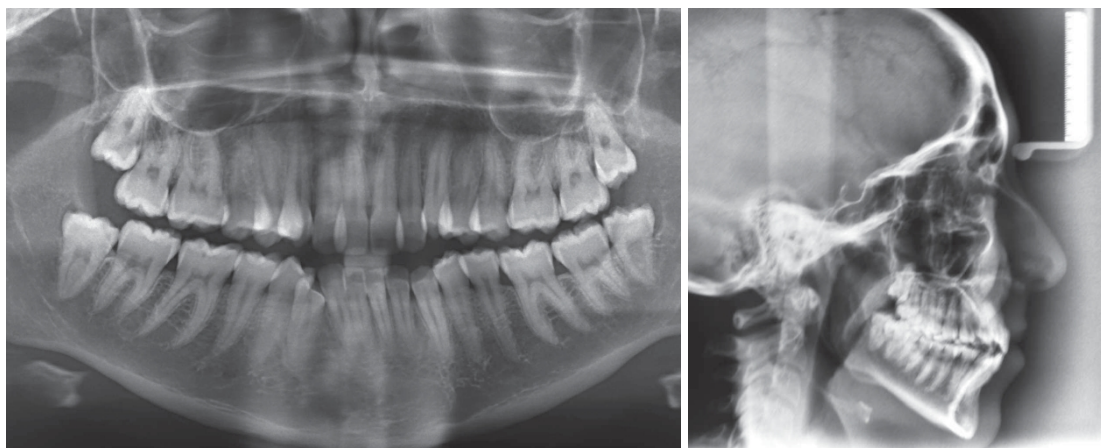


Fig. 1 - Initial Rx

This device is individually constructed and designed and allows a modification of the transverse maxillary dimension mainly through dento-alveolar remodelling to be achieved under the action of light, continuous forces. The Leaf Expander® consists of a metal frame made of surgical-grade steel, with a central screw whose activation generates the compression of a Nickel-Titanium leaf spring system. Deactivation of the leaf spring generates a controlled expansion of the upper arch through a dento-alveolar action. As this was an asymmetrical cross discrepancy (> right), it was not possible to fully compensate for the cross with this device, but it was necessary to use right cross elastics.

The use of a lingual arch was necessary to control the lower anchorage.

Brackets were assembled in a direct and sequential technique to allow optimal torque control in the S.W. technique.

The docking of 12 and 22 was carried out in the late therapy phase using brackets rotated 180° then normalised in the final therapy phases.

**Examination of the head and face (Fig. 2):**

Frontal asymmetry of the face with skeletal hyper-divergence and well-presented mandibular body accentuated by the patient's thinness. Irregular smile with slight lip incompetence. Evident alteration of the tone of the peri-orbicular musculature.



*Fig. 2 - Initial extraoral photos*

**Functional examination:**

The patient reports recurrent episodes of musculotensive pain.

Presence of bilateral sporadic clicking and pain in the right and left TMJ area. The non-coincidence of the midlines almost completely disappears in maximum opening, thus showing a picture of functional slippage of the mandible. An initial condition of condylar meniscal incoordination is likely.

The patient did not want to perform further diagnostics with right and left joint MRIs.

### **Intra Oral Examination (Fig. 3):**

Unilateral right cross, high grade upper and lower crowding.

xNon-coincidence of the interincisive lines and asymmetrical molar and canine occlusion with Class I on the left and Class II on the right at molar and canine level. Presence of 12 and 22 in cross palatal. OVB absent. OVJ absent.



*Fig. 3 - Initial intraoral photos*

### **Examination of the models (Fig. 4):**

#### **Maxillary arch:**

- Teething present from 17 to 27.
- Asymmetrical arch.
- Severe crowding.
- Presence of 12 and 21 in palatal position, 13 and 23 in vestibular ectopia.
- Rotations of 16, 17, 26, 27.

#### **Mandibular arch:**

- Teething present from 37 to 47.
- Strongly asymmetrical arch.
- High degree of crowding.
- 43 in vestibular ectopic position.
- Rotations.

#### **Sagittal occlusal relationships:**

- Asymmetrical molar and canine occlusion with Class I on the left and Class II on the right
- OVJ equal to 0mm.
- Slight deepening of the spee curve.

#### **Vertical occlusal relationships:**

- OVB absent due to presence of head-to-head occlusion at incisal level.

#### **Transverse occlusal relationships:**

- Severe reduction of maxillary and mandibular transverse diameters.
- Cross at the level of 12 and 22 for their position in the palatal area.

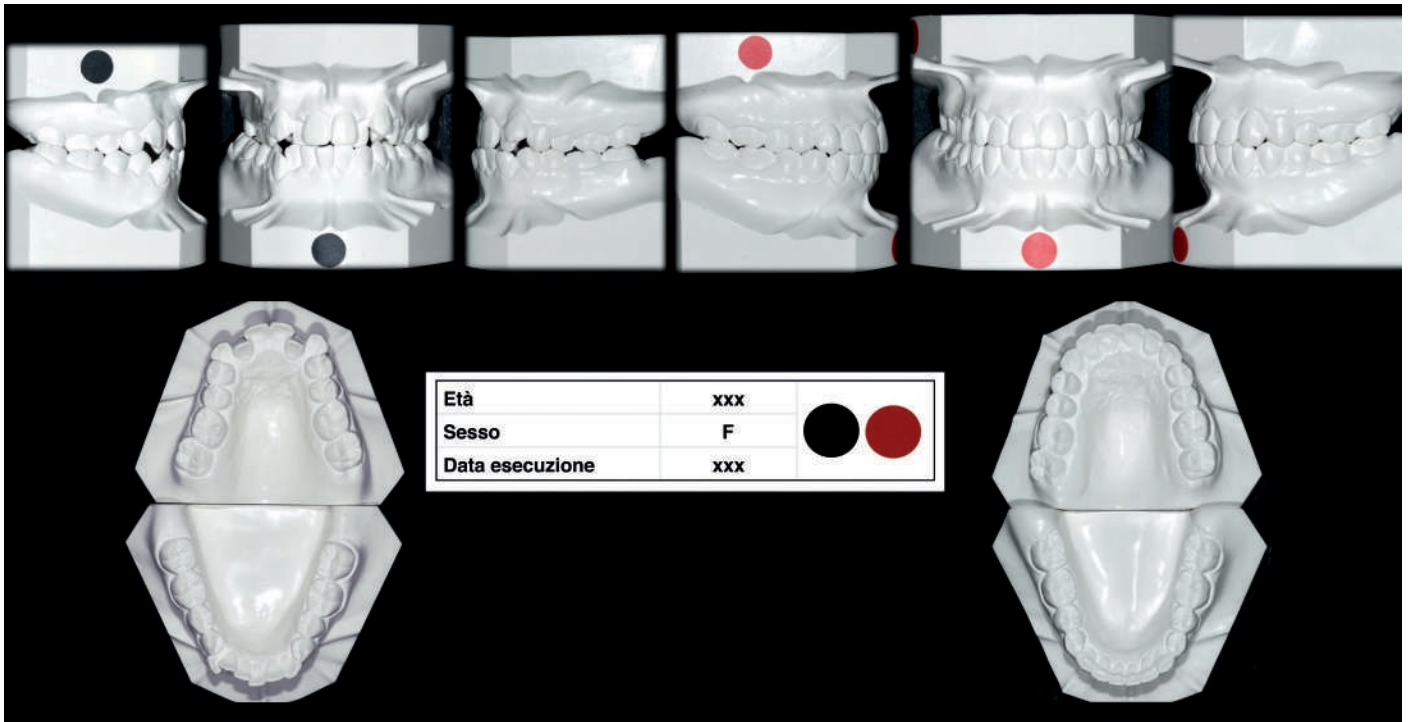


Fig. 4 - Photos of models before and after treatment

## TREATMENT PLAN

The skeletal age of the patient and the type of malocclusion were decisive in planning the treatment plan.

The importance of the transverse reduction of the upper jaw and the presence of the extended right cross necessitated a large alveolar dentoid remodelling with the need to reshape 14, 15 and 16 in a decisive and less important manner 24, 25 and 26.

The use of the 900 g Leaf Expander® Leone was managed with periodic reactivations every 4 to 5 weeks, and in any case when the two opposing leaf springs were visibly displaced. On average, 4 to 6 activations were given per appointment for a total period of about 6 months. Through this protocol, it was possible to develop light, predetermined and continuous forces that allowed important control of the expansion movement and vestibular inclination of the supporting teeth. (13,14,15,16) As highlighted in the literature, if the construction of the device is performed in an optimal manner, guaranteeing a correct modelling at the level of the collar of the supporting teeth, it is possible to obtain a movement in which a good component of body displacement cannot be disregarded. The transversal correction was not obtained entirely with this method but, considering the important asymmetry of the maxillary arch, it was necessary to use elastic cross braces, applied on the entire right side. The patient's cooperation was optimal and this allowed a good correction to be obtained in a relatively short time.

The position of 12 and 22 was corrected with sequential bonding, paying great attention to obtaining correct root positioning. For this purpose, the two attachments were positioned rotated by 180° to take advantage of a greater correction on the root vestibular torque.

The lower arch presented major criticalities related to severe crowding and the vestibular ectopic position of 43. The correction was carried out by initially maintaining an important anchorage control and paying great attention to the proclination of the incisal group.



Fig. 4a - Leaf Expander® 900 g



In the following steps, the use of asymmetrical and vertical elastics was crucial in order to achieve class ratio correction and correct OVB. The achievement of correct gingival aesthetics and symmetry of the parabolas was entrusted to a recontouring of the gingival margins performed using the diode laser (Fig. 5).



Fig. 5 - Gingival recontour programming with aesthetic purposes and elastic bands for finishing

## THERAPY RESULTS

The treatment course was completed in 1 year and 10 months. The results obtained can be summarised as follows

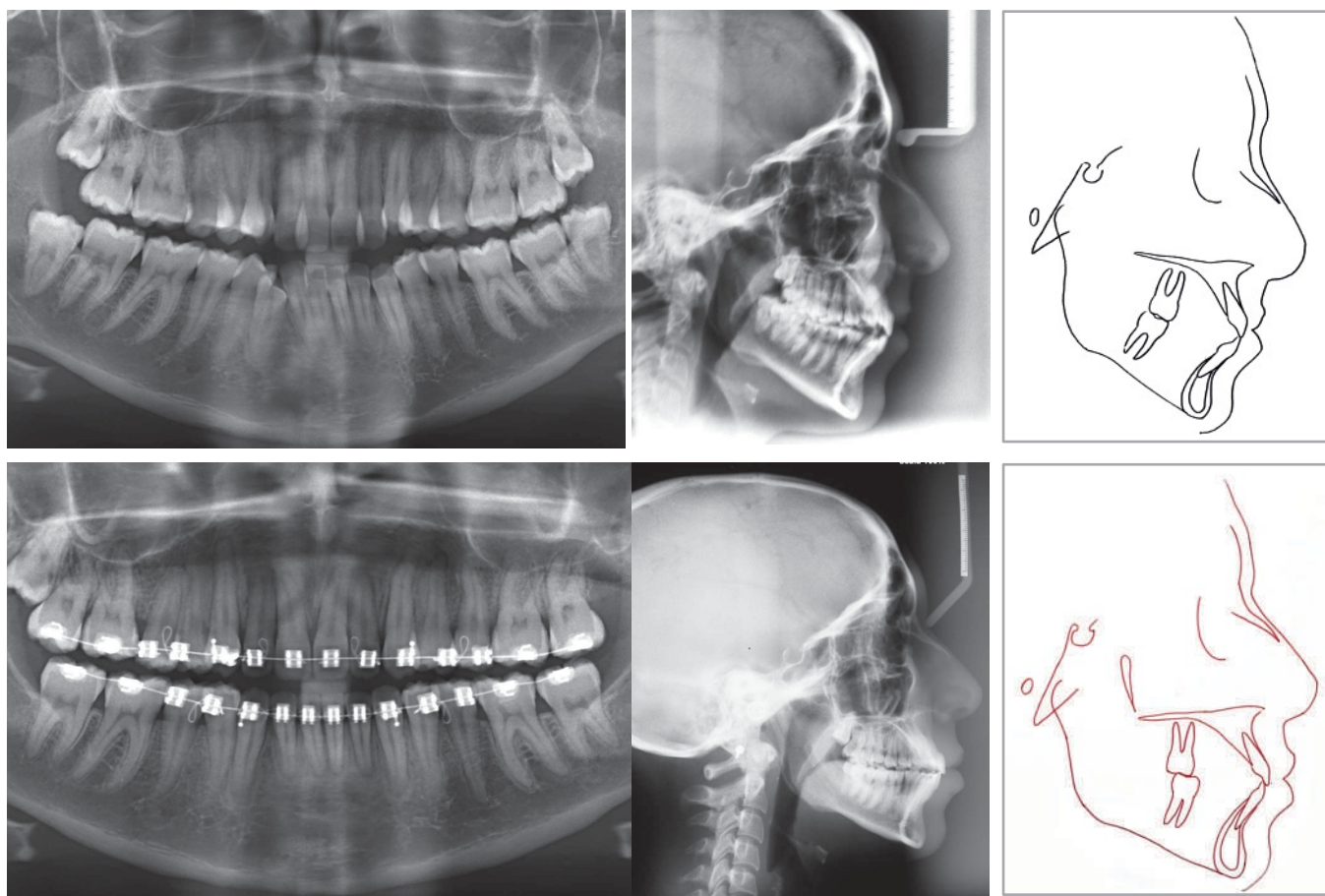
### Skeletal

From a strictly cephalometric point of view, changes in numerical terms are detectable both in the improvement of class ratios with a slight reduction in AN/Pg linked mainly to mandibular advancement and in skeletal divergence showing improvements with a reduction in SN/GoGn (Tab.1).

SAGITTAL SKELETAL RATIOS			
Maxillary position S.N /	A82° +/- 3.5°	76°	76,5°
Jaw position S.N /	Pg80° +/- 3.5°	71°	73°
Intermaxillary sagittal relation A.N / Pg	2° +/- 2,5°	5°	3,5°
VERTICAL SKELETAL RATIOS			
Maxillary tilt S.N / ANS.	PNS8° +/- 3.0°	16,5°	14°
Jaw inclination S.N / Go.	Gn33° +/- 2.5°	44,5°	42,5°
Vertical Intermaxillary Relationship ANS.PNS / Go.	Gn25° +/- 6.0°	28°	28,5°
DENTO-BASAL RELATIONS			
Inclination Upper Incisor +1 / ANS. 6.0°	PNS110° +/-	113°	111°
Inclination Lower Incisor -1 / Go.	GN94° +/- 7.0°	102°	95°
Lower Incisor Compensation -1 / A.Pg (mm.)	2 +/- 2 mm	5 mm	XXX
DENTAL REPORTS			
Overjet (mm)	3.5 +/- 2.5 mm	0	XXX
Overbite (mm)2.5	+/- 2.5 mm	0	2 mm
angle132° +/- 6.0°	Inter-incisive	117°	124,5°

Tab. 1 - Summary table of cephalometric and dental values

The correction of the transverse maxillary deficit was achieved through the use of the Leaf Expander® and dento-alveolar remodelling. Obviously, the therapy was performed on an already adult subject with no growth potential and, as was to be expected, skeletal changes could only be detected within a minimal range.



*Fig. 6 - Comparison of Rx and tracings at the beginning and end of treatment*

#### **Soft tissue**

The facial appearance shows major changes with an improvement in facial symmetry and smile. The musculature appears more relaxed as the lip competence is markedly improved.

#### **Dental**

From the dental point of view, a good dental alignment was obtained with both right and left canine and molar I occlusion classes. The midlines are coincident and OVJ and OVB are within normal ranges.

After the orthodontic appliance was removed, the patient underwent professional tooth whitening and to improve the symmetry of her smile, a gingivectomy of the upper arch was performed using a laser technique. The result is a smile with a valid aesthetic line and a fullness that is certainly more expressive and more harmonious with the patient's face.



*Fig. 7 - Final extraoral photos*



*Fig. 8 - Final intraoral photos*



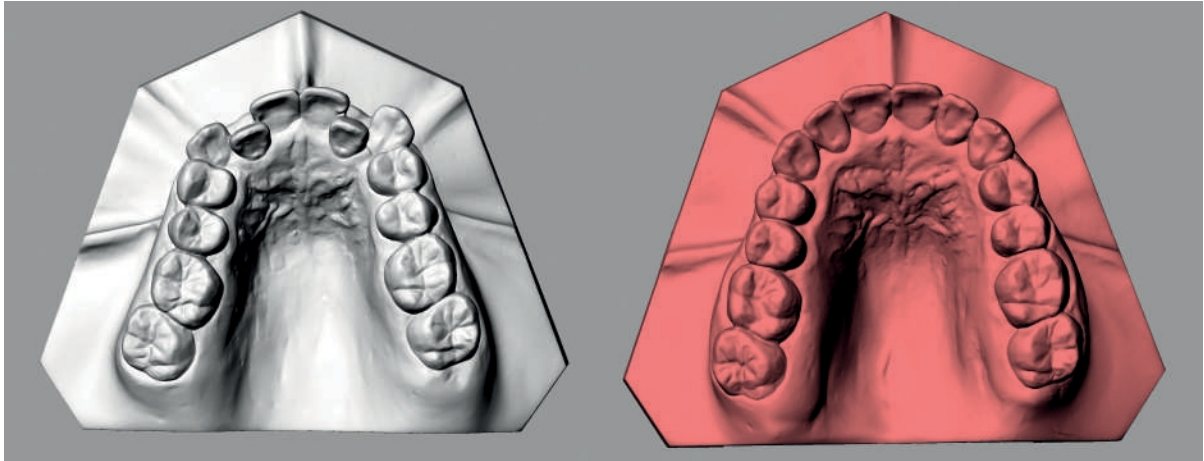


Fig. 9 - Before treatment and end of treatment

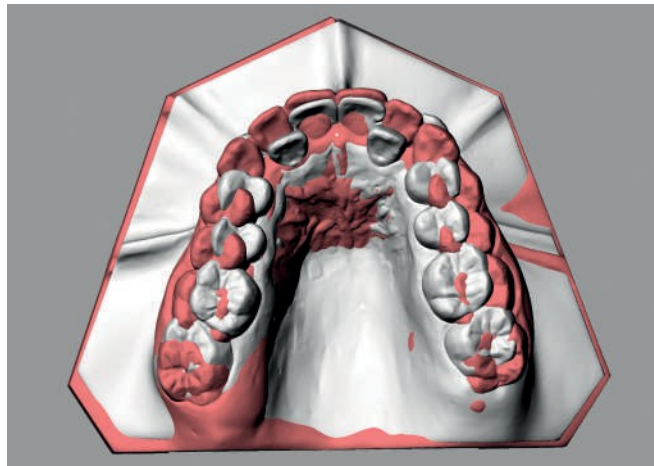


Fig. 10 - Pre- and post-imposition

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