The posterior crossbite is the most common transversal malocclusion and is generally accompanied by crowding of the upper arch. (Harvold et al. 1972; Bishara and Staley 1987). The devices used for this purpose, in addition to increasing transverse diameters, produce an increase of length of the arch. (Adkins et al. 1990). Many authors have described apparatus for maxillary expansion with different requirements for technical characteristics. The effect of the expansion of the dental arch on the palatine bases decreases with increasing age, in relation to the increase of the rigidity of the facial skeleton. When implementing a treatment of orthopedic maxillary expansion, the objective is to obtain minimal dental effects with the maximum skeletal effect (Haas 1961).

It was also shown that slow maxillary expansion can have orthopedic effects in growing individuals (Cotton 1978, Hicks 1978, Bell and Le Compte 1981 Mossaz 1989). In 2013, based on the experience acquired by the operators, Leone® introduced a radical change to the spring-activated expander, which led to the elimination of the coil spring and was replaced by a new active element; The Ni-Ti Memoria Leaf Spring-Activated Expander (MLSAE).
MEMORIA® Leaf Spring Activated Expander

The structure has remained quite similar to that of an RPE expander, but in this case the screw activation compresses a double leaf spring in Ni-Ti which, during deactivation recovers its size, leading to a calibrated expansion of the upper arch (Fig. 1).

Two types of leaf springs are currently commercially available, the Light 500 gram. and Medium 800 gram. The size of the body of the screw is 11x12x4 mm., so reduced and also adaptable to critical conditions such as very narrow palates or arches with transverse deficiency.

To adapt to different clinical contingencies, there is a choice between two devices:

1. In the first type there are two leaf springs and they have an expansion of up to 6 mm. while around the central screw is 0.4 mm. As the holes are positioned at each quarter turn, each activation of the screw determines an expansion of 0.1 mm. Performing therefore 8-10 activations per month in a single solution, reaching the maximum number of activations, equal to 35 activations (Fig. 2);

Fig. 1 - The new type of Calibrated Expander, characterized by the double leaf Ni-Ti spring

MEMORIA® Leaf Spring Activated Expander

Fig. 2 - Features of screw with double leaf spring
2. The second type is characterized by the presence of three leaf springs that allow to obtain an expansion of 10 mm and the achievement of a maximum of 50 activations. Also in this case the forces can be expressed by 500 (Light) or 800 grams. (Medium) (Fig. 3).

| A2703-10 | light spring | 500 g approx |
| A2704-10 | medium spring | 800 g approx |

<table>
<thead>
<tr>
<th>11 mm</th>
<th>4 mm</th>
<th>Ø</th>
<th>activation turns</th>
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<tbody>
<tr>
<td>arms</td>
<td>body</td>
<td>for maximum expansion limit</td>
<td></td>
</tr>
<tr>
<td>1.5 mm</td>
<td>16 mm</td>
<td>10 mm</td>
<td>0.4 mm</td>
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The MLSAE can also be used for carrying out the rapid expansion of the palatine suture. In this case changing the management of activations to determine the diastase, the screw must be activated leading to full compression of the active element (leaf spring). Additional device activations involve direct action of the screw, with production of orthopedic forces. In case of failure of the suture diastasis in borderline subjects by age, the deactivation of the screw will bring back the spring in the range of action of the light forces, restoring the function of calibrated expansion.
The patient (9 years, male) was presented to our observation for the presence of right unilateral cross bite, correctly diagnosed by the pediatrician.

The usual process of clinical evaluation and documentation (Study models, photos intra and extra oral, Orthopantomography and TeleRx LL) (Fig. 4-5) led to the diagnosis of:

- skeletal and dental Class I in normofacial subject
- early mixed dentition
- right unilateral crossbite due to transverse maxillary deficiency
- right mandibular shift with secondary ipsilateral deviation of the midline
- light crowding of upper lateral incisors

Fig. 4 - Nine years, male - Initial photos
The goals of treatment are:

- expansion of the maxilla for correction of unilateral crossbite
- normalization of overjet and overbite
- alignment of the midlines
- correction of the form and function of the arches

The prognosis in similar cases is good, especially when you consider that no collaboration is required. Routinely patient compliance is good, given the absolute absence of pain. For the treatment we have chosen the new MLSAE with double leaf spring in Ni-Ti and light force of 500 grams (Fig. 6).
At the clinical control after a month, we observed the increase of the expansion between the two leaves of the spring. We therefore performed 8 activations to allow an approximation of the same and the start of a new expansion. This operation was repeated monthly, reaching a total of 32 activations (Fig. 7).

**Fig. 7**

**Fig. 7 - Sequence of expansion and activation:**
1 - MLSAE with ligation locking
2 - expansion after 1 month
3 - reactivation performed in the same session
4 - expansion at 3 months
5 - reactivation of the spring
6 - expansion after 4 months
At the end of the expansion an occlusal radiograph was taken which clearly shows bone remodeling, which occurred at the level of the median suture of the palate (Fig. 8).

Fig. 8 – Occlusal Rx at the end of expansion. The suture diastasis has not been verified, typical of orthopedic expansion but bone remodeling is observed, which occurred at the level of the median suture of the palate, and characterizes slow expansion.
After 4 months from the start of the expansion the crossbite was corrected and we expect stabilization with the appliance in place. Waiting for a further three months allowed us to appreciate clinically the eruption of the upper lateral incisors, the centering of the midlines and the harmonization of the form and function of the arches. The achievement of objectives (Fig. 9), and the cephalometric analysis and radiographic feedback confirm the clinical results (Fig. 10).

Fig. 9 – Nine years, male - Final photos
The results prove the effectiveness, efficiency and ease of use of the calibrated expander, in the correction of a transverse maxillary deficiency in a growing patient.

The advantages of this equipment mainly consist of:

- ease of activation
- visual inspection of the activation
- safe handling
- compliance by the patient
- mainly body movement of teeth
- predetermined forces, light and constant
- predictability of results

The effects are clinically and radiographically similar to those reached by the RPE. Therefore, the Memoria Leaf Spring Activated Expander is an excellent alternative to the RPE in certain conditions. ♦