The first attempt to perform rapid maxillary expansion was made in 1860 by E.H. Angell, an orthodontist from San Francisco. By using a fixed appliance with an expansion screw, he was able to correct a posterior crossbite in a 14-year-old patient. In the following years, rapid maxillary expansion was used with alternating results especially in the European countries. In the 1960s, this technique gained popularity in the United States as well as Europe. Towards the end of the same decade, the Biederman expander became the most common design adopted for maxillary expansion. This appliance consists of four bands cemented to the upper dentition with a central “hygienic” screw that is connected to the bands with stainless steel arms. At a later date, Leone Orthodontic Products offered significant improvements in the screw design with the release of their Hygienic Screw A0620. These improvements included a smooth surface without rough areas and very rigid structure as a result of laser welding the arms of the device to the central body.

In recent years, a series of developments were proposed for this basic expansion system of the maxilla. All of these proposals included the use of fixed appliances incorporating bands and expansion screws. The outcome of these proposals resulted in an “expanded” range of therapeutical applications. The new features/applications of the “ad hoc” screw design include:

1) Utilization of only two teeth as anchorage instead of four to perform transverse orthopedic expansion of the maxilla
2) Multidirectional expansion not only on the transverse plane but also on the sagittal plane
3) Uni-lateral and bi-lateral contraction of the maxilla
4) Orthopedic/Dentoalveolar effect by varying the activation rate of the screw (3 activations per day for an orthopedic effect, 2 activations per week for a dentoalveolar effect).

The result of these innovative concepts is schematized in Figure 1, which illustrates the wide range of therapeutic opportunities of fixed appliances with screws applied to the maxillary dentition.

**Orthopedic effect on the transverse plane**
An orthopedic expansion of the maxilla

**Dentoalveolar effect**
Two types of dentoalveolar effects can be achieved:
- Uni-lateral (right/left)
- Bi-lateral

* = in expansion or in contraction
can be performed by using orthopedic forces (3 activations per day) when the mid-palatal suture is responsive. This is dependent upon the skeletal maturity of the individual patient. The effect is bi-lateral and anchorage of the device can utilize the first permanent molars, the second deciduous molars or the first deciduous molars (fig. 2).

**Dentoalveolar effect on the transverse plane**

When the biological reaction of the mid-palatal suture to orthopedic forces is absent, expansion on the transverse plane consists of dentoalveolar movement of the anchoring teeth (2 activations per week). This movement both conceptually and clinically can be described as a pure dental translation. The force generated by the screw is transmitted to the anchoring teeth via an extremely rigid system and this force is delivered close to the center of resistance of the teeth. Both expansion and contraction are obtainable by the dentoalveolar translation effect, which can be uni-lateral or bi-lateral. Either the first upper permanent molars or the upper premolars are used for bi-lateral activation (fig. 3). The uni-lateral expansion or contraction of an individual first permanent upper molar is obtained by a specially-designed screw with an anchoring tripod that includes the contralateral first permanent molar and the first premolars (fig. 4).

**Effects on the sagittal plane**

Another newly developed screw is able to induce dentoalveolar movement either in a distal or mesial direction within the upper arch. The indications for dentoalveolar movement on the sagittal plane are:

1) Distalization of the upper molars which results in correction of Class II occlusal relationships
2) Creation of space in the upper arch in cases with tooth-size/arc-size discrepancy
3) Mesialization of the upper arch in patients with Class III occlusal relationships
4) Dental movements as part of prosthodontic rehabilitation.

The first permanent molars are the anchoring teeth for the distalization of the permanent second molars. Either the second deciduous molars or the first premolars are the anchoring teeth for the distalization of the first permanent molars (fig. 5). In cases with Class II malocclusion the therapeutic protocol requires the use of both upper and lower appliances. The upper appliance includes distalization screws and a soldered labial arch with hooks for Class II intermaxillary elastic traction (240 g. per side). The lower appliance consists of a lingual arch soldered on bands on the first permanent molars (fig. 6). The therapeutical protocol for Class III cases requires the same screw-device, which is used to mesialize the anterior part of the maxillary arch. This movement complements the
orthopedic effect of the facial mask in conjunction
with intermaxillary Class III elastics (fig. 7). The dis-
tal/mesial dentoalveolar movement of the upper per-
manent molars can be also carried out uni-laterally. Once
again a special screw and an anchoring tripod are
required (fig. 8a and 8b).

Rotatory effect
When sagittal asymmetry in the upper arch is pre-
sent (for example Class II molar and canine rela-
tionships on one side of the upper arch and Class I or
Class III molar and canine relationships on the
other side of the upper arch), devices with special
two-directional screws can be used to produce den-
toalveolar movements in a mesial direction on one
side and in a distal direction on the other side. Bands
are usually placed on the first or second per-
manent upper molars and on the first upper pre-
molars (fig. 9)

In conclusion, the series of special expansion screws
derived from the original Leone A0620 offers a vast
range of therapeutic possibilities, which is suitably
described as “360-degree maxillary expansion”.
This new series of fixed appliances with expansion
screws represents the therapeutic solution for the
majority of malocclusions, when you consider that
maxillary transverse deficiency is the most common
orthodontic problem encountered and the remain-
binae of malocclusions consist mainly of crowd-
ing and Class II/Class III problems. This latest
offering by Leone provides the contemporary 
orthodontist with an essential and extremely versa-
tile therapeutic tool.

(This article was completed with the scientific col-
laboration of Dr. Tiziano Baccetti and Dr. Lorenzo
Franchi, University of Florence.)

Fig. 9

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VELTRI

PRECISION EXPANDERS
FOR BIOMECHANICS

Bilateral sagittal screw
Veltri A0629-08 and A0629-11
A versatile bilateral screw to provide distal, mesial and sagittal expansion movement in the treatment of Class II and III malocclusions.

Monolateral screw
Veltri A0626-08 and A0626-11
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Rotary screw Veltri A0627-08
Its design allows a mesial movement on one side and a distal movement on the other side.

For your nearest stocking dealer contact the LeoneAmerica National Sales Office at (800) 242-9986

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