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Interocclusal Elastic Planes (I.E.P) in the control of open bite and TMJ problems

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"Control of the vertical dimension is one of the more interesting matters in orthodontics" (Nidoli G.). In their lecture at the XIV National S.I.D.O Congress (1996), Nidoli et al. (1) demonstrated various methods of treating skeletal open bite. These included extraoral traction of the upper molars, vertical chin cup, extraction of four molars (first or second molars), and orthognathic surgery. From the review of the literature, one can see that the results obtained from these methods in growing subjects and cephalometrically evaluated are not very stable and are prone to relapse.

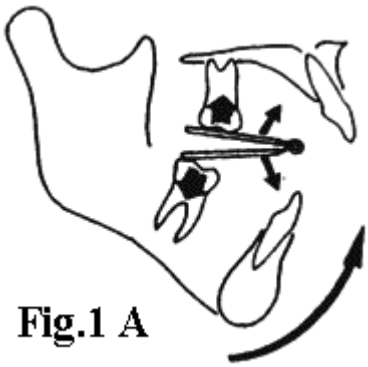

Fig.1 A

In fact these methods fail to consider two factors:

- -a) the vertical underdevelopment of the mandible, understood in the absolute sense or relative to the vertical overdevelopment of the maxilla;
- -b) the hypotonicity of the elevator muscles, which is almost always associated with open bite.

The conclusion of Nidoli et al., with which we also agree, is that *"To effectively achieve autorotation of the mandible, it is important to distract the condlyes, as suggested by Sander et al. (2)"*. In a 1985 paper, one of us (3) presented the so-called "Lateral Spring Bites" (fig. 1a,b), derived from the lower plate of Woodside (4). In spite of the encouraging clinical results, the springs which were fabricated with 0.9 mm wire presented a major drawback. In addition to being uncomfortable to the patient, the springs needed to be replaced roughly every 2 months, resulting in high laboratory costs. We do not believe that the triple spiral springs (fabricated with 1.1 mm wire) which Sander uses, are a major improvement either since no metal springs can tolerate elastic deformations in excess of 100.000-120.000.

Although this number may seem high, based on 3 deformations per minute, one can see that over 2500 deformations occur after 14 hours! of wear. This translates into fatigue of the metal springs in little more than a month.

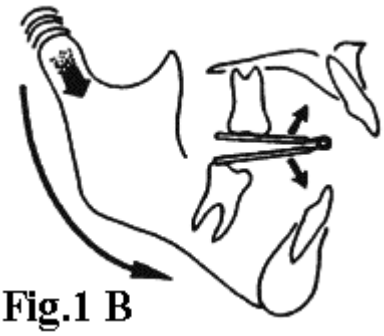

Fig.1 B

In 1985 Mizrahi (5) presented a double plate with vertical springs which needed to be regularly replaced every four weeks. To facilitate the replacement of the springs, they had be fabricated a standard dimension. The interchangeability of the springs made this appliance excessively mobile in the transverse plane. For years we have conceived and clinically tested different systems of interchangeable soft springs. However, the following obstacles have always been encountered: the stability (stiffness) of the springs increased the brittleness and vice versa. We have also tried to replace the action of the springs with that of the lateral planes with different varieties of elastic materials as advocated by Kinetor of Stockfish (6) .

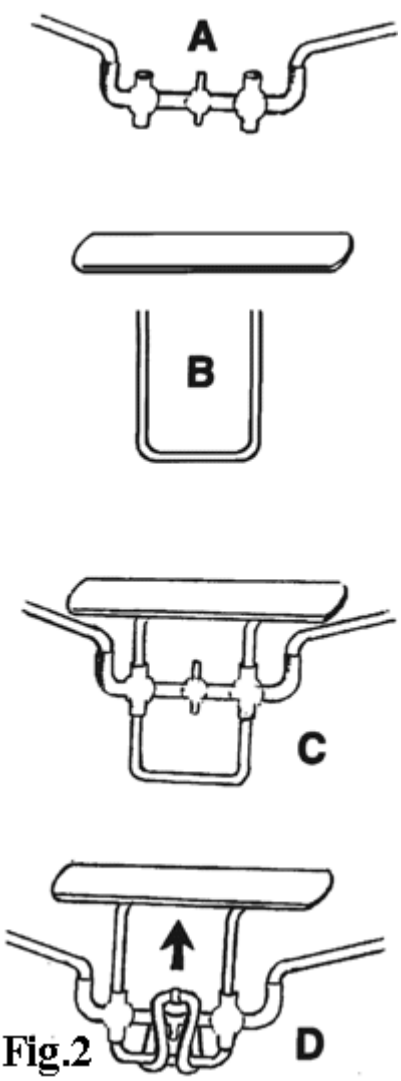

Fig.2

However, the clinical results have not been encouraging, especially as far as stimulation of the vertical growth of the mandible is concerned. We believe that this may be related to insufficient elasticity of the materials and therefore to an insufficient action of vertical stretching of the condyle. Recently one of the authors (M. Salvione) has had the idea of achieving the action of the metallic springs with orthodontic elastics, which can easily be changed by the patient. The appliance on which the elastics are worn is not simple to fabricate in the laboratory, but it is possible that it can become an industrial product with acceptable costs in a standard size easily adaptable to any upper or lower arch on a registered model. This appliance is made from a double frame, which for easier description we will refer to as a primary frame and a secondary frame. The primary frame (fig.2A) is made from a 1.1 mm wire partially inserted in a tube which serves as reinforcement.

The other two segments of the same tube are soldered at right angles to the first one. A small pivot of 0.9 mm wire is also connected at halfway between the two small tubes. The secondary frame (fig. 2B) is made of a 1 mm U shaped wire with two parallel arms, which are inserted into the tubes. A stainless steel plane of 0.5 mm thickness is soldered on top of the U shaped wire (fig.2C). The double frame is now ready for bilateral adaptation to any upper or lower arch, exerting intrusive force on as many teeth as possible (fig.3).

The appliance is activated by hooking an orthodontic elastic to the pivot between the two tubes of the primary frame, passing it under the horizontal part of the secondary frame, and hooking it again to the pivot (fig. 2D, 8,9). In this way the steel planes move 5 mm occlusally and the patient is forced to exert a force which can gradually be increased by increasing the number of elastics or their thickness.

This appliance seems to be easily tolerated by patients due to the thin steel planes. The biological effects of this appliance are threefold: A) Providing a stimulus to the vertical growth of the condyle and therefore of the mandible: this is a very positive effect and certainly more stable. Obviously this is possible only in growing patients. B) Intrusion of the molars and possibly reduction of the vertical development of the alveolar processes.

Intrusion of the molars is not always considered a positive effect and is not always stable, especially if limited to one or two teeth.

Since the steel planes are parallel to the occlusal plane, the force is distributed on a higher number of teeth than under the action of springs.
C) Providing a stimulus to the masticatory musculature: this is also a very positive effect, without which it is not easy to maintain the results of point B.

In addition to these orthopedic effects, there could also be therapeutic effects, as shown by Rocabado (7) in cases of TMJ compression pathology. Unlike all the appliances with springs, the Elastic Interocclusal Plane is light and therefore easily tolerated by patients. This is particularly important in adult patients with TMJ problems for whom the double distraction plates of Rocabado are effective but are too bulky.

We have presented an original solution to an old problem in the hope that this appliance will soon be in industrial production and therefore readily available from any laboratory.

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