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Functional Appliance Treatment of Severe Class II Malocclusion in the Early Mixed Dentition

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The objectives of early orthodontic intervention are to correct obvious problems and to intercept developing problems and prevent them from becoming worse.1,2 Class II malocclusions with more than 6mm of overjet can be treated early with functional appliances to:

- Eliminate functional problems such as lipsucking habits.3,4
- Reduce overjet, decreasing the risk of traumatic occlusion on the upper incisors.5
- Improve the esthetic appearance of patients with convex profiles and retrusive lower faces.5-7
- Control the skeletal discrepancy between the upper and lower jaws by stimulating mandibular growth.8,9
- Help develop a normal occlusion and facial harmony10 and promote stability throughout the period of facial growth.

This article will analyze the clinical and cephalometric effects of an activator on a patient with a severe Class II malocclusion in the early mixed dentition.

Appliance Design

The functional appliance used in this case was a modification of the original Andresen-Haupl activator: a removable acrylic monobloc attached to the maxillary arch by Adams clasps on the second decidous molars. A vestibular arch provided active pressure against the labial surfaces of the maxillary incisors, and a jackscrew was embedded in the palatal acrylic. The incisal edges and part of the labial surfaces of the maxillary and mandibular incisors were capped to prevent tipping.

The activator was produced from a construction bite that positioned the mandible forward into an edge-to-edge incisal relationship and an overcorrected Class I molar relationship to stimulate mandibular growth. This mandibular position was maintained by an extension of the base acrylic from the upper jaw to the lower. The bite registration must be taken carefully to avoid lateral displacement.

Case Report

A 7 1/2-year-old female presented with the chief complaint of the unesthetic appearance of her protruding upper incisors (Fig. 1). Clinical evaluation revealed an asymmetrical, convex soft-tissue profile; the lower lip was functioning entirely behind the maxillary incisors, which were between the lips at rest. The patient, who was in the early mixed dentition, had a Class II molar and canine relationship, an overjet of more than 6mm, and an overbite of 5mm. There were diastemas in the upper arch, but the lower arch was well aligned.

Cephalometric analysis showed a skeletal Class II malocclusion (ANB = 8°, FMA = 23°) due to mandibular deficiency (SNB = 76°) and maxillary protrusion (SNA = 84°). Both the upper and lower incisors were proclined (1-FH = 120°, IMPA = 96°), although the maxillary proclination was

more pronounced (Table 1).

An activator was prescribed to stimulate mandibular growth during the development of the dentition (Fig. 2). The bite registration was taken with a vertical opening that exceeded the freeway space by 4mm.

The patient was instructed to wear the appliance a minimum of 14 hours a day. The midpalatal screw was activated only once a month to follow maxillary transverse development. Contact was maintained between the appliance and the maxillary posterior teeth, but the mandibular posterior teeth were encouraged to erupt by progressively trimming the acrylic on their occlusal and lingual sides.

After 15 months of treatment with the activator, a significant improvement in the soft-tissue profile was evident, and labial competence was achieved (Fig. 3). With the overbite increased and the overjet reduced, the sagittal relationship between the arches improved, although a Class I molar relationship had not yet been obtained.

The effects of the activator were evaluated cephalometrically after about two years of treatment (Fig. 4). A reduction of 3° in ANB was achieved, mainly by a forward displacement of the mandible (SNB = 80°) and by controlling the sagittal growth of the maxilla (SNA = 85°). Mandibular length increased by 3mm, showing substantial growth of the lower jaw (GoMe = 65mm). The vertical skeletal dimension was slightly improved (FMA = 24°), and the inclination of the upper incisors was reduced by 5° (1-FH = 115°).

As the permanent dentition was completed, a Class I molar and canine relationship was obtained, and the overjet and overbite were corrected (Fig. 5). The activator was then worn at night only for retention. Four years after the beginning of treatment, the facial profile reflected the anterior displacement of the mandibular soft-tissue structures and a better lip balance (Fig. 6). A second phase of fixed appliance therapy is planned.

Post-treatment cephalometric analysis (Fig. 7) indicated an improvement in the sagittal jaw relationship (ANB = 2.5°), due almost entirely to a forward movement of B point (SNB = 81.5°) and a further increase in mandibular length (GoMe = 69mm). The vertical dimension, as expressed by FMA, increased by 2°. Compared to the beginning of treatment, the activator moved the maxillary incisors 10° palatally (1-FH = 110°), and the mandibular incisors seemed stable (IMPA = 96°). A comparison of linear measurements using the occlusal line (OL) and its perpendicular through sella (OLp) showed an increase in all values due to craniofacial growth, but a greater increase for the mandibular skeletal and soft-tissue structures (OLp-B, OLp-Pg, OLp- Me, OLp-LL, and OLp-PgC).

Conclusion

The principal advantage of functional appliances in Class II therapy is that they not only correct the malocclusion, but are also effective in improving the soft-tissue profile and the intermaxillary relationship.11 Early treatment can eliminate etiologic factors such as sucking habits, restoring normal growth and reducing the severity of skeletal abnormalities.

Once the growth period is over, treatment options become more limited. Mixed-dentition therapy can therefore help create a more stable and esthetic occlusion than if treatment is delayed until the

permanent dentition. •

FIGURES

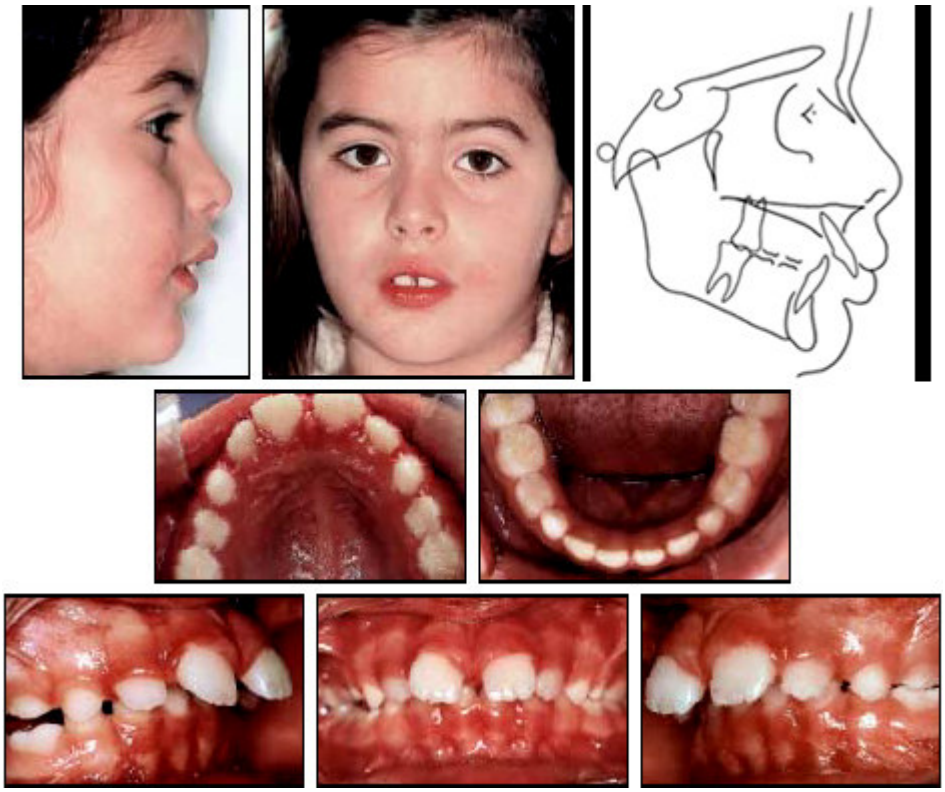

Fig. 1 7 1/2-year-old female with severe Class II malocclusion before treatment.

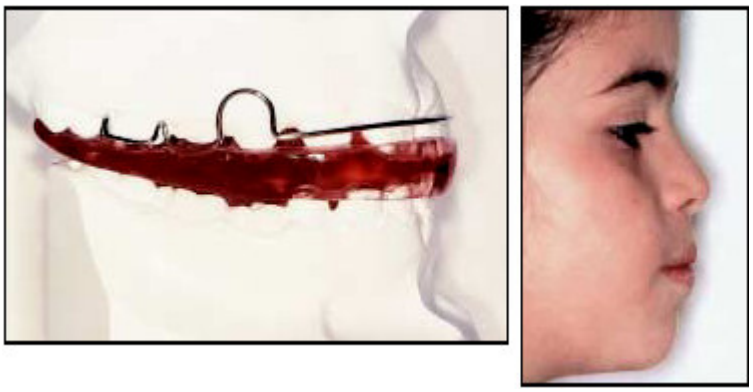

Fig. 2 Activator appliance on cast and in mouth.

Fig. 3 Patient after 15 months of activator treatment.

Fig. 4 Patient after 22 months of activator treatment.

Fig. 5 Patient after 30 months of activator treatment.

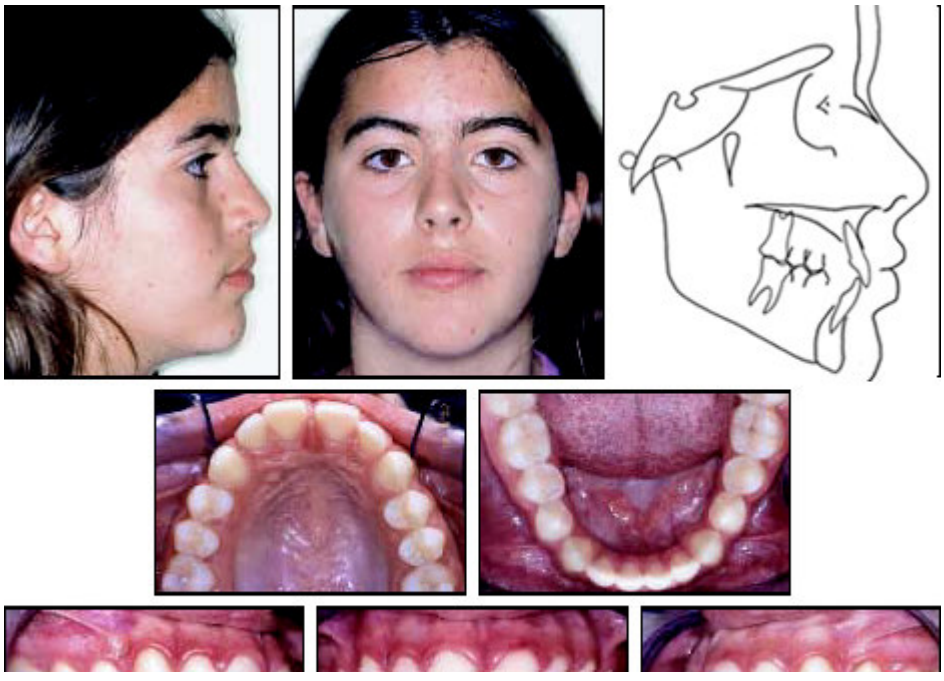

Fig. 6 Patient 48 months after beginning of treatment, prior to fixed appliance phase.

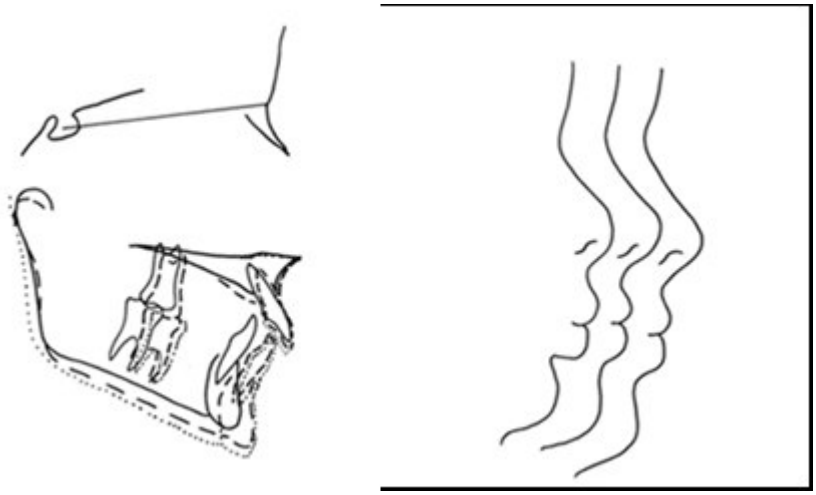

Fig. 7 Superimpositions and profiles before treatment (solid lines), after 22 months of treatment (dashed lines), and 48 months after beginning of treatment (dotted lines).

TABLES

TABLE 1
CEPHALOMETRIC DATA

	Before Treatment	After 22 Months	After 48 Months
SNA	84°	85°	84°
SNB	76°	80°	81.5°
ANB	8°	5°	2.5°
SN	65mm	66mm	67mm
GoMe	62mm	65mm	69mm
FMA	23°	24°	26°
SN-GoMe	33°	33°	34°
1-FH	120°	115°	110°
IMPA	96°	97°	96°
OLp-A	74mm	76mm	76mm
OLp-B	69mm	78mm	82mm
OLp-Pg	75mm	83mm	86mm
OLp-Me	70mm	79mm	82mm
OLp-1	71mm	78mm	83mm
OLp-1	85mm	86mm	87mm
OLp-UL	93mm	95mm	98mm
OLp-LL	92mm	97mm	100mm
OLp-PgC	86mm	95mm	99mm

Table. 1

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