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Case report

Herbst appliance palatally anchored in the treatment of dental Class II malocclusion: a case report

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ABSTRACT

Introduction: In this case report, we present a Class II malocclusion correction using only an Herbst appliance palatally anchored with miniscrews.

Case presentation: 11.9-year-old female presented with the chief complaints of increased anterior upper teeth proclination; permanent dentition with a Class II division I malocclusion; before sagittal correction with Herbst appliance, we applied a palatal screw to obtain maxillary expansion. The device was removed after 12 months of treatment.

Conclusion: This clinical case showed a simple orthopedic and dentoalveolar approach using skeletal anchorage, which can effectively correct a dental Class II malocclusion and frontal proclination of the upper incisors.

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INTRODUCTION

Herbst appliance, proposed by Emil Herbst¹ and Hans Pancherz², is one of the most used fix functional appliances (FFA) in the skeletal and/or dental class II malocclusion treatment.

The main effects of this device are i) maxillary restrain, ii) mandibular advancement, iii), maxillary teeth posterior displacement, iiiii) mandibular teeth anterior displacement.^{3,4}

Perinetti et al.⁵ showed that one of the key factor to increase the skeletal effect is the treatment timing. As a matter of fact, the maximum skeletal mandibular advancement can be obtained when the treatment is performed during the pubertal growth peak. Treatment performed during the post-pubertal growth phase showed high values of dentoalveolar compensation.

Nevertheless, a certain part of dental compensation is also present when the treatment is performed during the pubertal growth peak. This dental compensation is due to a loss of anchorage resulting in a proclination of the lower teeth, a distalization of the upper molar and a retroclination of the upper frontal teeth.⁶

The final effect is the reduction of the overjet but consequently also a lack of skeletal correction.

In the past, different systems have been proposed to increase the anchorage control in the upper and lower or both dental arches, such as lower acrylic splint arch, Class III elastics^{7,8} and lower miniscrew to avoid the frontal lower teeth proclination.⁹

Recently Manni et al.¹⁰ have proposed the use of the upper and lower buccal miniscrew with an elastomeric chain to enhance the anchorage of the teeth and increase the skeletal effect. The Authors showed a reduction of the mandibular incisor flaring and a slight forward movement of the upper molars.

Nevertheless, significant miniscrew failures have been shown when applied on the buccal side in both arches. Mohammed et al.¹¹ review showed that failure in the maxilla buccal side is from 9,2 to 16,4 depending on the insertion area and from 9,9% to 13,5% in the buccal side of the mandible. The failure values in the palatal area is less (between 1,3% and 5,5%).

This clinical case concerns the management of the palatal anchored Herbst Appliance using miniscrews to avoid molar distalization in the upper arch.

CASE PRESENTATION

An 11.9-year-old female presented with the chief complaints of increased anterior upper teeth proclination. The patient showed permanent dentition with a Class II division I malocclusion;

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increased overjet (7 mm) and overbite (4 mm); a transversal discrepancy of 3 mm; mandibular midline slightly shifted to the left; multiple diastemas in both arches. The profile was retrognathic due to a lower lip retrusion; the smile appeared inadequate with excessive upper teeth coverage by the upper lip and interposition of the lower lip (Fig. 1). Written informed consent was obtained from the parents for publication of this case report and accompanying images.

McLaughlin cephalometric analysis (Dolphin Imaging & Management Solutions, Chatsworth, CA USA.) showed a skeletal class I malocclusion with a hypodivergent pattern. The incisors were proclined in the upper arch and retroclined in the lower one (tab. 1). The patient was in the prepubertal period (MPS 1/2) according to Middle Phalanx Maturation Method (Fig.2).¹²

The treatment plan consisted of a maxillary skeletal expansion and dentoalveolar correction of Class II dental malocclusion using a fix functional appliance as Herbst anchored by palatal miniscrews. The aims were i) expansion of the upper arch with correction of the midlines, ii) control of the first upper molar position (both vertically and horizontally), iii) mesialization of mandibular teeth with lower incisor proclination, and iiiii) correction of the upper incisors torque for the restoration of the labial seal.

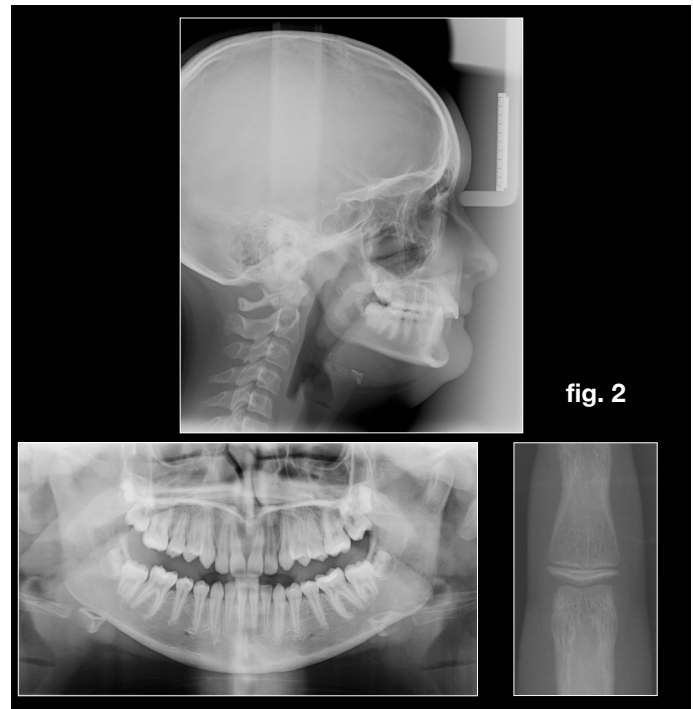


Figure 2. Initial lateral head, pan and middle phalanx films.



Figure 1. Initial extra and intraoral photographs.

Treatment Progress

After direct intraoral application of two miniscrews (PSM Medical Solution, Tuttlingen, Germany), according to the safe zones proposed by Ludwig et al.¹³ a traditional impression was taken. The technician successfully made a Herbst Appliance (Rollo Band and Miniscope, American Orthodontics, Sheboygan, WI, USA) anchored on miniscrews through a palatal screw (Forestadent, Pforzheim, Germany). Fig. 3 shows the appliance and the intraoral application in the final position during the patient intercuspitation. The skeletal expansion protocol was one activation per day until ideal expansion was obtained. Fig. 4 shows the Herbst Appliance's maxillary component before expansion, after expansion and the final result after 10 months of treatment.

Treatment Results

The patient facial lateral esthetics was improved in terms of lips and chin profile. Frontally the smile line was regular, with an adequate dental torque (Fig. 5) - intraorally, a full class I was obtained with normal Overjet and Overbite. The midlines were aligned. The total treatment time was 12 months. Cephalometric data and superimposition showed a slight mandibular advancement, the sagittal and vertical stability of the first upper molars, normalization of the upper incisors torque, slight extrusion of the first molars, and incisors proclination in the lower arch (Fig. 6). No retention has been used in this patient.

Figure 7 shows a 1 year of follow-up. It possible to note a complete eruption of the upper first molars with Class I relationship and reasonable maintenance of other parameters.

DISCUSSION

A recent review stated that a prepubertal phase treatment using removable functional appliances could correct Class II malocclusions mainly with a dentoalveolar compensation.¹⁴ Currently, no data are available about the effect of functional

fixed appliances in a prepubertal patient. The reason is that in permanent dentition, the use of fixed functional appliances is quite mandatory: consequently, patients could be in every pubertal growth phase.¹⁵

In this clinical case, the patient showed a permanent dentition during the prepubertal phase. For this reason, the use of the Herbst Appliance to obtain both dental and skeletal effects was justified.

According to the treatment plan, the main aim has been achieved through skeletal anchorage of the upper teeth (first molars). As a matter of fact, the amount of sagittal correction is ascribable to a dentoalveolar compensation in the lower arch and a skeletal mandibular advancement. In this case, the initial retroclination of the lower frontal teeth justified the loss of tooth anchorage in the lower arch.

The results in the upper arch are perhaps more compelling: the normalization of lips competence, the presence of diastemas, and the skeletal expansion induced a spontaneous correction of the frontal torque without skeletal effects, which resulted stable at the 12-month follow-up.

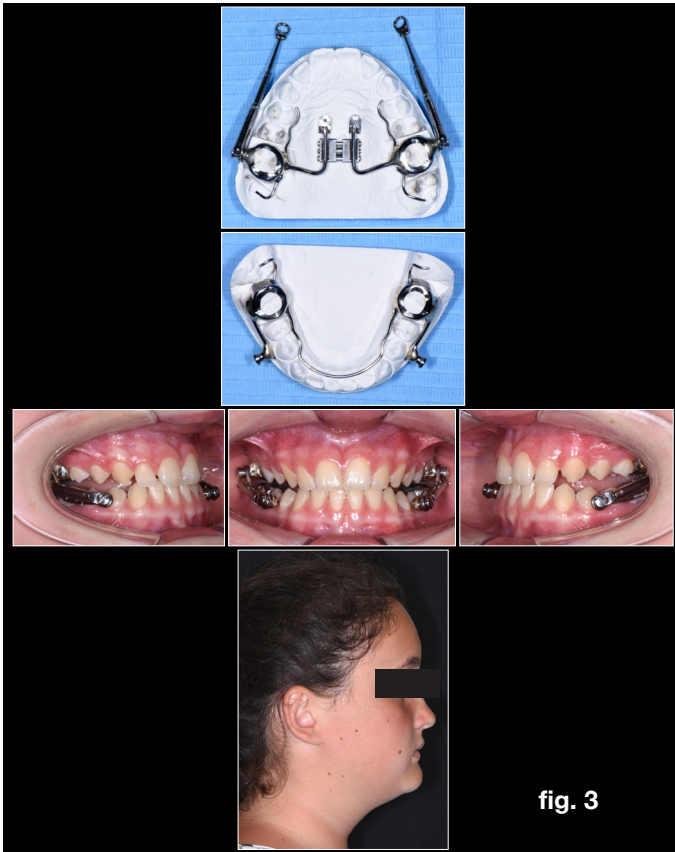


Figure 3. Herbst appliance on casts, intraoral application and profile during the first application.



Figure 5. Extra and intraoral photographs after Herbst Appliance debonding.

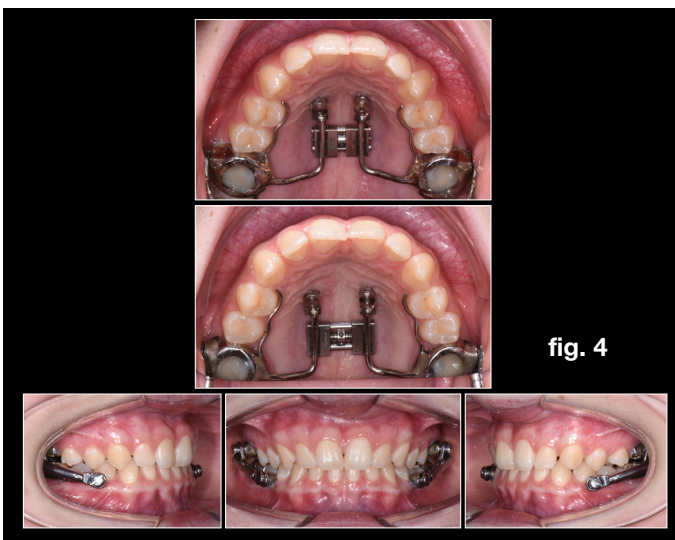


Figure 4. Palatal vault before and after expansion, lateral and frontal view after 10 months of treatment.

CONCLUSION

This clinical case showed a simple orthopedic and dentoalveolar approach using skeletal anchorage, to effectively correct a dental Class II malocclusion and frontal proclination of the upper incisors.

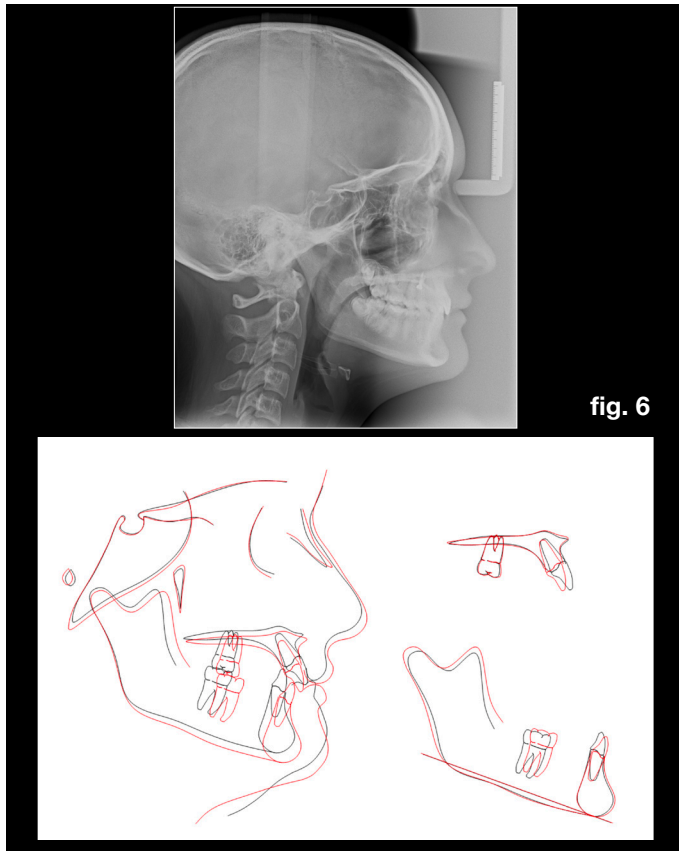


fig. 6

Figure 6. Lateral head film and superimposition of pre- and post-treatment cephalometric tracings.



fig. 7

Figure 7. Extra and intraoral photographs after 1 year of follow up

CONFLICT OF INTEREST

The authors of the present article declare no conflicts of interest.

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