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Case Report

Use of miniscrew implant to control lower incisor proclination during Herbst therapy: A case report

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ABSTRACT

Aim: The purpose of this article was to report the orthodontic treatment of a growing patient with Angle Class II malocclusion, without teeth extraction and/or orthognathic surgery.
Methods: The Herbst mandibular protractor, associated with miniscrew implants (MSIs) installed in the mandible, was used for the correction of Class II malocclusion. The use of skeletal anchorage was aimed to reduce lower incisor proclination.
Results: Restriction of maxillary growth, distalization of maxillary molars, and control of the lower incisor proclination were observed.
Conclusion: The association of MSIs with mandibular protractor device allowed minimization of side effects as well as enhancement of skeletal and dental effects with excellent predictability and minimal patient collaboration.

1. Introduction

Class II malocclusion observed in approximately one-third of growing individuals [1] decreases with age, with fewer than 50% of the individuals presenting spontaneous correction [2]. When evaluated in relation to the overjet, the prevalence of Class II decreased from 22.6% in patients 8 to 11 years of age to 13.4% in individuals aged between 18 and 50 years [3].

Treatment of Class II depends on an appropriate diagnosis, which requires a clear description of the problem. It is well-documented that Class II subjects presented a higher prevalence of mandibular retrusion [4–6]. But studies based on the ANB (A point, nasion, B point) angle reported that Class II individuals present a maxillary protrusion when compared with Class I patients, but significant differences in mandibular anteroposterior position are not found [7,8]. It is known that when the anteroposterior maxillomandibular skeletal relationship undergoes changes over the years, the differences are related to mandibular growth, which occurs in the circumpubertal growth period and not maxillary, which usually completes its lion-share of growth by around 10 years [9].

With the knowledge that a large amount of superior and posterior condylar growth would result in an inferior and anterior displacement of the mandible [10], orthodontists began to use functional orthopedic appliances to treat Class II. Mandibular advancement devices (including the Herbst apparatus) began to be used for the correction of skeletal discrepancies. Although they reduce or eliminate the need for fixed appliances, future extractions with an orthodontic indication, and even orthognathic surgery [11], mandibular functional appliances have been questioned regarding the facilitation of mandibular growth and anterior projection of the pogonion [12,13].

Herbst therapy was introduced by Emil Herbst [16] in 1905, aiming to treat Class II malocclusion by anterior positioning of the mandible without needing patient cooperation [14,15]; the therapy was reintroduced into the international scenario by Pancherz [15] in 1979. A reciprocal intermaxillary anchorage of the Herbst causes a lower and anterior force on the lower teeth (action), as well as a superior and posterior force on the upper teeth (reaction) [17]. Thus, the Herbst appliance promotes some orthodontic effects, which depending on the patient's clinical characteristics, may be considered undesirable, such as retroinclination of the upper incisors and proclination of the lower incisors [17–23]. In addition,

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Herbst therapy also can cause a sagittal restrictive effect on the maxilla [18,21,24–26], which is favorable in cases associated with maxillary prognathism. To minimize dental effects for the benefit of orthopedic gain, the orthodontist should plan the anchorage in the most appropriate and efficient way.

Recently, miniscrew implants (MSIs) and miniplates have emerged as alternatives to eliminate or significantly reduce anchorage loss and to simplify biomechanics in the orthodontic practice scenario [27–30]. The difference of these devices comes from "absolute anchoring," a term used to describe a unit that remains stationary under orthodontic forces, thus allowing absolute anchorage control [31]. In this perspective, skeletal anchorage systems have altered orthodontic mechanics, without requiring patient collaboration, leading to desired outcomes in a more predictable fashion [32]. Due to the ease of installation and removal, patient comfort, and low cost, MSIs can be routinely used by orthodontists. It is very important to plan the position in which they will be installed to obtain the force vectors and, consequently, for treatment success [27–30].

The article's purpose was to report the orthodontic treatment of a growing patient with Class II malocclusion and exaggerated horizontal and vertical trespasses, without teeth extraction and/or orthognathic surgery. The Herbst associated with MSIs installed in the mandible were used to correct Class II malocclusion, to reduce or avoid lower incisor proclination.

2. Clinical case

2.1. Diagnosis and etiology

Patient S.L., male, 12 years and 7 months old, leucoderma, healthy, with no specific medical problems, attended the Texas A&M University College of Dentistry, Dallas, Texas, USA, seeking orthodontic treatment with the main complaint of horizontal and vertical trespass. The patient presented good oral hygiene and absence of periodontal problems.

Facial analysis revealed a convex profile with an acute lip-mental angle, an obtuse nasolabial angle, a mesoprosopic facial pattern, passive lip seal, a low smile line, a moderate buccal corridor, and absence of significant asymmetries. In the intraoral examination, bilateral Angle Class II molar and canine relationship was observed, with anterior maxillary crowding (3 mm) with the right maxillary lateral incisor in lingualversion and left maxillary lateral incisor in labioversion, vertical overlap (>75%), dental midlines coincident with facial and upper and lower quadrant, and catenary arc formats, respectively (Fig. 1).

The cephalometric analysis (Table 1) showed skeletal Class II due to mandibular retrognathism, hypodivergent vertical pattern, and deep bite with lingual inclination of the upper and buccal proclination of the lower incisors (Fig. 2A). Panoramic radiograph showed presence of all four third molars in formation (Fig. 2B).

2.2. Treatment

Treatment objectives

The objectives of the treatment were (1) to achieve Class I molar and caninerelationships, (2) correct the overjet, (3) improve or maintain the facial profile, (4) relieve the slight anterior-superior crowding, (5) correction of the deep bite, and (6) moderate expansion of the maxilla.

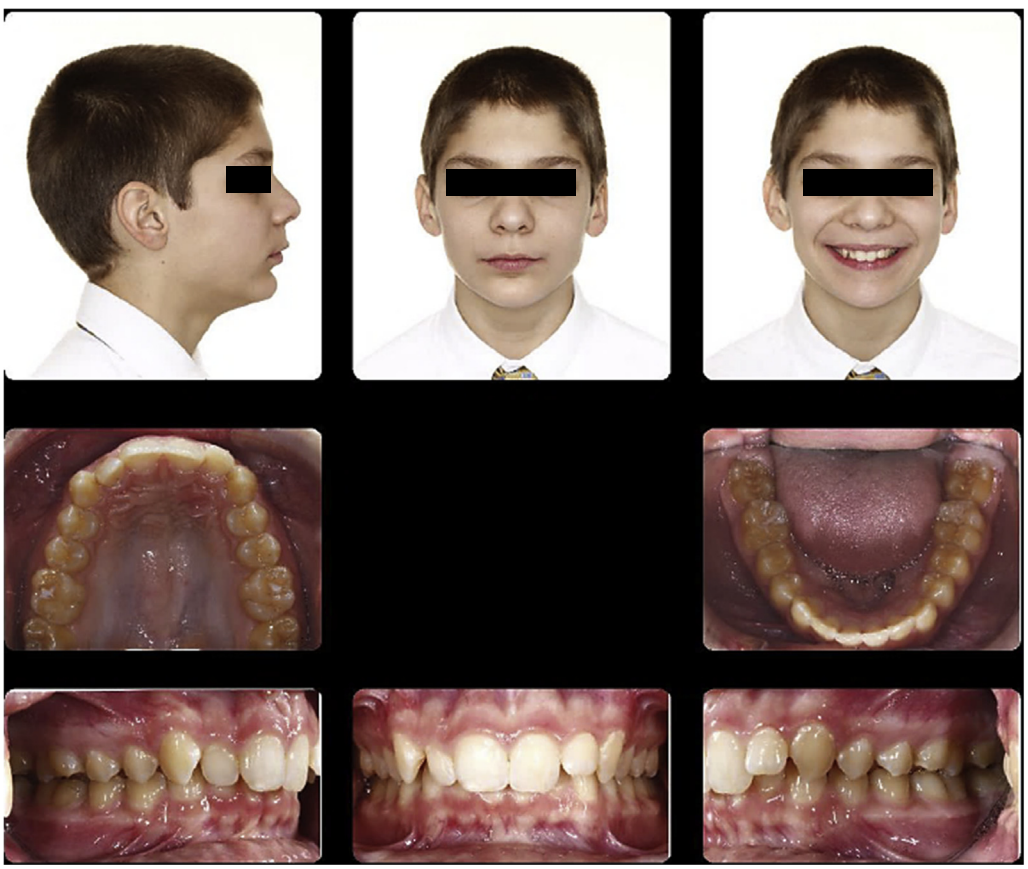

Fig. 1. Pretreatment facial and intraoral photographs.

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