Integration of the Herbst and Begg appliance in the management of severe Class II malocclusion

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Abstract
The efficacy of the Herbst appliance in a normalizing sagittal relationship in patients with a Class II malocclusion is well-documented. This case report describes the treatment of a 14-year-old male patient with severe Class II Division 1 malocclusion due to retrognathic mandible and mildly prognathic maxilla, convex profile, and lip trap. He had severely proclined maxillary incisors and retroclined mandibular incisors, overjet of 13 mm and overbite of 7 mm. Since the patient was in the peak pubertal growth phase, growth modulation was carried out with the Herbst appliance for 8 months, followed by fixed appliance therapy with the Begg appliance for 11 months. Combination of Herbst and Begg appliance led to a very favorable treatment outcome and greatly improved the patient’s appearance.

Keywords: Begg appliance, four spur torquing auxiliary, Herbst appliance

Introduction
An important prerequisite for successful orthodontic treatment outcome is patient co-operation. This often poses problems for the clinician, especially when the treatment involves the use of bulky, removable functional appliances for growth modulation. Failure to adhere to the prescribed schedule of appliance wear leads to a slow response to treatment or no response at all. The use of appliances specifically designed for noncompliant patients addresses this ubiquitous problem.

The Herbst appliance was first described by Emil Herbst in 1909 and later reintroduced by Pancherz in the late 1970s. It is a rigid fixed functional appliance that eliminates the need for patient co-operation and is frequently used for the treatment of Class II malocclusion. It consists of a bilateral telescopic mechanism that applies a distalizing force on the maxilla and its dentition and an anteriorly directed force on the mandible and its dentition. In a review article on the effect of functional appliances on skeletal growth, Aelbers and Dermaut concluded that the Herbst appliance is able to influence mandibular length to a biologically significant degree.

The Begg appliance, first introduced by Raymond Begg in 1956, offers rapid correction of increased overbite and overjet using light forces and obviates the need for additional anchorage reinforcement.

This article describes the management of a patient with severe Class II Division 1 malocclusion treated by the acrylic splint Herbst appliance, followed by the Begg appliance.

Case Report
A 14-year-old male patient reported with the chief complaint of forwardly placed upper front teeth and an inability to close the lips. Extraoral clinical examination revealed a convex profile, incompetent lips with a lip trap and acute nasolabial angle. On intraoral examination, it was found that the patient had Angle’s Class II Division I malocclusion with overjet of 13 mm and overbite of 7 mm. The maxillary incisors were severely proclined, and mandibular incisors were retroclined due to the lip trap.

Cephalometric analysis revealed skeletal Class II jaw bases (ANB = 6°) due to a deficient mandible and mildly prognathic maxilla. The vertical parameters indicated a horizontal growth pattern (mandibular plane angle = 21°, GoGn to SN = 27°). Dental parameters indicated proclined and forwardly placed maxillary incisors (U1 to NA = 12 mm, 32°) and retroclined and backwardly placed mandibular incisors (L1 to NB = 1 mm, 12°). Examination of the hand wrist...
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Radiograph showed that the patient was in the peak pubertal stage of growth.

Treatment objectives included:
1. To address the skeletal discrepancy of the jaws
2. To correct the axial inclination of the teeth
3. To achieve ideal overjet and overbite
4. To achieve facial harmony.

**Treatment rationale**
Considering the clinical and cephalometric findings, it was decided to treat this case in two phases. In the first phase, we decided to address the skeletal discrepancy of the jaws by growth modulation with the Herbst appliance since it is one of the most effective and powerful Class II correctors. The acrylic splint modification of the appliance described by McNamara and Howe was used since it is less prone to breakage. After the growth modulation phase, fixed appliance therapy using the Begg appliance was planned to keep in mind the severe tipping and proclination of the maxillary anteriors, critical anchorage, deep bite and horizontal growth pattern of the patient. The functional correction achieved by the Herbst appliance was retained by the use of Class II elastics.

**Treatment progress**
The construction bite was made with the mandible advanced by 7 mm and with a vertical opening of 3 mm. The appliance was constructed on mounted models, and the splints were then cemented [Figure 3]. Oral hygiene instructions were reinforced since it was anticipated that food stagnation would be a problem. After 8 months of appliance wear, the necessary sagittal correction was achieved. The acrylic splints were removed, and the second phase of treatment was initiated using the Begg appliance which allowed rapid correction of the incisor inclination and deep bite. The four spur torqueing auxiliary (0.012” Premium plus Australian SS) was used for lingual root torqueing of the upper incisors [Figure 4]. The second phase was completed in 11 months and good Class I occlusion with near ideal overjet and overbite was achieved [Figures 5-7].

The retention protocol involved lingual bonded retainer from canine to canine for the mandibular arch and Begg retainer with an anterior inclined plane for the maxillary arch.

**Discussion**
Class II malocclusions resulting from mandibular retrusion are generally treated with functional appliances that create orthopedic forces directed at the mandibular structures, and the Herbst appliance is one of the most efficient appliances. Its treatment effects have been well documented in clinical studies, especially by Pancherz. Most clinical studies of Herbst appliance regardless of the design of the appliance have indicated that in general the effects of treatment are divided more or less equally into dentoalveolar and skeletal effects. The major dentoalveolar effects produced are: (1) Maxillary molar distalisation and maxillary incisor...
retroclination. (2) Mandibular molar mesialization and mandibular incisor proclination. Skeletal effects consist primarily of mandibular adaptation with relatively minor adaptations in the maxillary complex.\[5\] Numerous studies have documented a significant increase in mandibular length compared to untreated controls, ranging from 2.7 to 3.5 mm for a 1 year treatment period with the acrylic splint Herbst appliance.\[6\]

The post-Herbst changes observed in this case were very favorable and in agreement with the findings of previous studies. The maxillomandibular relationship improved as indicated by ANB of 3°. The posttreatment dentoalveolar changes showed that the maxillary incisors retracted significantly by 5 mm linear and 4° angular. The mandibular incisors were uprighted by 6° [Table 1]. The use of the Begg appliance allowed efficient bite opening and the overbite was reduced to 3 mm. Correction of the inclination of the incisors further contributed to reducing the overjet to an acceptable 3 mm. Superimposition of cephalograms showed an increase in the mandibular body length by 2.2 mm.
increase in lower facial height, mesialization and extrusion of mandibular molars.

There was a significant improvement in the soft tissue profile with elimination of the lip trap, lip incompetency and normalization of the nasolabial angle [Figure 8]. The results achieved were highly satisfying for both the patient and the clinician.

**Table 1: Skeletal and dental changes**

| Measurement            | Pretreatment | Posttreatment |
|------------------------|--------------|---------------|
| **Skeletal changes**   |              |               |
| SNA                    | 83°          | 83°           |
| SNB                    | 77°          | 80°           |
| ANB                    | 06°          | 03°           |
| GoGN to SN             | 27°          | 28°           |
| **Dental changes**     |              |               |
| U1 to NA (mm/°)        | 12 mm/32°    | 7 mm/28°      |
| L1 to NB (mm/°)        | 1 mm/12°     | 2 mm/18°      |
| U1 to point A          | 14 mm        | 9 mm          |
| U1 to SN               | 116°         | 107°          |
| L1 to mandibular plane | 85°          | 93°           |
| **Soft tissue changes**|              |               |
| Upper lip to S line    | 6 mm         | 2 mm          |
| Lower lip to S line    | 0 mm         | 2 mm          |
| Nasolabial angle       | 88°          | 97°           |

SNA: Sella – Nasion- pt A, SNB: Sella – Nasion- pt B, ANB: pt. A – Nasion – pt. B

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**References**

1. Pancherz H. History, background and development of the Herbst appliance. Semin Orthod 2003;9:3-11.
2. Ruf S, Pancherz H. When is the ideal period for Herbst therapy – Early or late? Semin Orthod 2003;9:47-56.
3. Aelbers CM, Dermaut LR. Orthopedics in orthodontics: Part I, Fiction or reality – A review of the literature. Am J Orthod Dentofacial Orthop 1996;110:513-9.
4. McNamara JA, Howe RP. Clinical management of the acrylic splint Herbst appliance. Am J Orthod Dentofacial Orthop 1988;94:142-9.
5. Peterson JE Jr, McNamara JA Jr. Temporomandibular joint adaptations associated with Herbst appliance treatment in juvenile rhesus monkeys (Macaca mulatta). Semin Orthod 2003;9:12-25.
6. de Almeida MR, Henriques JF, de Almeida RR, Weber U, McNamara JA Jr. Short-term treatment effects produced by the Herbst appliance in the mixed dentition. Angle Orthod 2005;75:540-7.