The Herbst Appliance
32 Years after Treatment

HANS PANCHERZ, DDS, OD
KRISTER BJERKLIN, DDS, OD

The Herbst® appliance was reintroduced into modern orthodontics by Dr. Pancherz in 1979, after it had been more or less forgotten for almost half a century.¹² Originally, the Herbst was banded only to four upper and two lower teeth (Fig. 1). In 1995, the design of the appliance was changed to a cast splint incorporating most of the teeth in both arches (Fig. 2). The effectiveness of the Herbst appliance in the clinical management of Class II malocclusions has been documented by many investigations, as summarized in the 2008 textbook by Pancherz and Ruf.³

In 2014 and 2015, the findings of a 32-year follow-up study after Herbst therapy were published in four papers.⁴⁻⁷ This article summarizes the most important results.

Study Protocol

Fourteen subjects (12 males and two females) were derived from an original sample of 22 consecutive Class II, division 1 patients, 12-14 years of age.⁸ All 14 patients were treated by Dr. Pancherz at the University of Malmö, Sweden, in 1977-1978, using the original banded Herbst appliance (Fig. 1). Due to major tooth irregularities after Herbst therapy, two subjects (Cases 1X and 8X) each had the four first premolars extracted and were treated with full multibracketed appliances for about a year. No post-treatment retention was performed in four subjects (Cases 2, 3, 6, and 10); the remaining 10 subjects wore fixed or removable retainers for two to four years.

Each patient was examined on four occasions: at T1, before Herbst treatment; at T2, 12 months after the Herbst appliance was removed and the occlusion had settled; at T3, six years after...
treatment (average age 20), when the radius epiphysis/diaphysis plate was closed; and at T4, 32 years after treatment (average age 46). Records for each subject included dental casts, lateral headfilms, intraoral photographs, and TMJ radiographs (conventional tomography at T3 and cone-beam computed tomography at T4). All 14 cases are shown here in picture collages (Fig. 3).

**Treatment Results**

*Dental casts:* A stable Class I long-term result was found in nine subjects (Cases 1X, 2, 3, 4, 7, 8X, 9, 10, and 11). Four subjects (Cases 5, 12, 13, and 14) exhibited partial Class II relapse, and one (Case 6) a full Class II relapse.

*Mandibular occlusal photographs:* In all subjects but three (Cases 3, 6, and 12), mandibular incisor irregularity (crowding) increased continuously during the 32-year post-treatment period. Although the mandibular third molars erupted fully in all but two subjects (Cases 5 and 11), no relationship was observed between the presence of third molars and the development of incisor irregularity.

*Lateral headfilms:* In all 14 cases, cephalometric superimpositions indicated a substantial amount of sagittal and vertical skeletofacial growth after age 20. Eleven of the subjects showed a long-term horizontal growth pattern (reduced mandibular plane angle). In Cases 1X, 9, and 11, however, the growth pattern was vertical (increased mandibular plane angle).

*TMJ radiographs:* Only three patients displayed adverse condylar and glenoid-fossa bone changes after Herbst therapy. In Case 5, bilateral osteoarthritic changes were seen both at age 20 (T3) and at age 46 (T4). In Case 8X, bilateral changes were noted at T4; in Case 14, unilateral changes were observed at T4.

* (text continued on p. 451)
Fig. 3 14 subjects treated with banded Herbst appliance (continued on next page). T1 = before treatment; T2 = 12 months after Herbst appliance removal; T3 = six years after treatment (average age 20); T4 = 32 years after treatment (average age 46). (Cases 9 and 11 were females with no TMJ tomograms from T3.)
Fig. 3 (cont.) 14 subjects treated with banded Herbst appliance (continued on next page).
Fig. 3 (cont.) 14 subjects treated with banded Herbst appliance (continued on next page).
Fig. 3 (cont.) 14 subjects treated with banded Herbst appliance (continued on next page).
Fig. 3 (cont.) 14 subjects treated with banded Herbst appliance (continued on next page).
Fig. 3 (cont.) 14 subjects treated with banded Herbst appliance (continued on next page).
Fig. 3 (cont.) 14 subjects treated with banded Herbst appliance.
Discussion

Overall, acceptable long-term results were confirmed in 14 consecutively treated Herbst patients who were re-examined six and 32 years after therapy. The post-treatment lower-incisor crowding was probably not due to Herbst therapy, but more likely a result of physiological processes that occur throughout life. A considerable amount of skeletofacial growth after age 20 was found in all 14 subjects, but it remains unclear when growth actually ceased between the ages of 20 and 46. In any case, it is important for clinicians to consider this late adult skeletofacial growth when planning dentofacial orthopedics, dental implantology, or orthognathic surgery. The Herbst appliance appeared to have no harmful long-term effects on the TMJ; our findings six and 32 years after treatment corresponded to those that would be expected in the general population.

In five of the 14 subjects, a partial or total Class II relapse was noted. These relapses appeared to have been caused by unstable interdigitation, persistent oral habits, and/or inadequate retention regimes. Although the relapse percentage may seem rather high, it should be remembered that no one had any experience in managing the appliance in 1977. A banded Herbst appliance with a simple anchorage system was utilized, in contrast to the cast-splint appliance used today (Fig. 2). Moreover, except for the two extraction cases (Cases 1X and 8X), no fixed appliances were used for final tooth alignment after Herbst therapy, as would now be common practice. We also routinely prescribe several years of post-treatment retention, using an activator and a bonded lower 3-3 retainer, for today’s Herbst patients.

REFERENCES