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Feature

The Wire-Reinforced Banded Herbst Appliance

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Figure 1: Wire-reinforced banded design of the Herbst appliance.

Figure 2: Wire-reinforced band (Specialty Appliances, Norcross, Georgia).

The Herbst[1,2] appliance has become increasingly popular for correction of dentoskeletal Class II discrepancies. The primary reason for this is the lack of need for patient cooperation. Unlike removable functional appliances, this appliance can be fixed to the teeth. Forced compliance translates into effective and predictable treatment results in a shorter period of time.

There are several different styles of the Herbst appliance, however, all have in common the sliding pin and tube assembly for mandibular advancement. Variations in appliance design which support the assembly include occlusal coverage splints,[3-5] stainless steel crowns,[6-7] and orthodontic bands.[8-10]

The banded Herbst appliance is "user friendly" because orthodontic bands are readily available and used routinely in orthodontics. By far, the single biggest advantage of the banded Herbst appliance is removal. A band-removing plier is used to remove the appliance in seconds.

Figure 3: Pre-treatment photographs.

The stainless steel crown Herbst design is the most popular style used today. Durability is the biggest reason for this trend. Ironically, most clinicians are less comfortable fitting stainless steel crowns than orthodontic bands. For this reason, a majority of stainless steel crowns are fit indirectly on working models by the orthodontic labs. It is fair to say that this is more prone to error than direct placement of bands in the mouth that are accurately transferred to working models.

Occlusal coverage of maxillary and mandibular first molars with stainless steel crowns also produces bite opening for some patients that is extreme. This can make the accommodation period longer and more difficult. Associated soft tissue strain can make the appliance therapy obvious. Finally, the removal of the stainless steel crown Herbst appliance typically requires removal with a high-speed handpiece and cutting bur. This procedure can be time consuming.

When the acrylic splint Herbst is bonded to the teeth, the risk of decalcification under the appliance increases. In the early 1980s there were even some reports that debonding of the acrylic splint

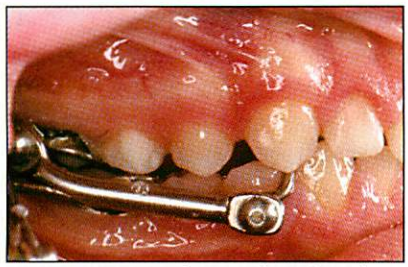


Figure 4: Progress photographs with Herbst appliance.

caused breakage of the teeth. This news led to the enthusiasm for the removable acrylic splint Herbst appliance. Unfortunately, a removable Herbst appliance defeats the primary purpose of this form of treatment.

The banded Herbst design described below never results in the kind of bite opening inherent to occlusal coverage splints and stainless steel crowns. It is also worth re-emphasizing that the banded Herbst can be removed with a band-removing plier in seconds.

In all likelihood, many practitioners using the more popular stainless steel crown Herbst appliance are unaware that the wire-reinforced banded design is extremely durable and well proven. It is not the same as the banded design of Pancherz made with conventional orthodontic bands about twenty years ago. Breakage resulted all too often when ordinary orthodontic bands were used. The wire-reinforced banded design is able to withstand the forces generated by the Herbst bite-jumping mechanism. The "newer" banded Herbst has overcome the shortcomings of the original appliance and may even offer advantages over the current alternative designs.

Appliance Design

I routinely use the banded Herbst appliance made by Specialty Appliances in Norcross, Georgia (Figure 1). Dr. Mike Rogers of Augusta, Georgia has been instrumental in its design and modifications over the years. The most significant improvement is the wire reinforcement of the bands. A wire surrounding the occlusal portion of the band is soldered in a continuous manner (Figure 2), which provides a dramatically stronger and more durable appliance.

The maxillary component can be either a transpalatal bar or expansion appliance, depending on the need for transverse coordination with mandibular advancement. When significant expansion is required, it should be accomplished prior to Herbst appliance placement. The axle is soldered to the band and reinforcement wire. The tubes are secured to the axle with hex head screws. The mandibular component is made up of a lingual arch connected to a wire labial to the premolars, crossing the occlusion between the first premolar and canine. The axle is soldered to the labial wire in the first premolar area. The pins are attached to the axle with hex head screws also. Arch wire engaging tubes can be added to either component, as can occlusal rests.

Figure 5: Post-treatment photographs.

Clinical Procedures

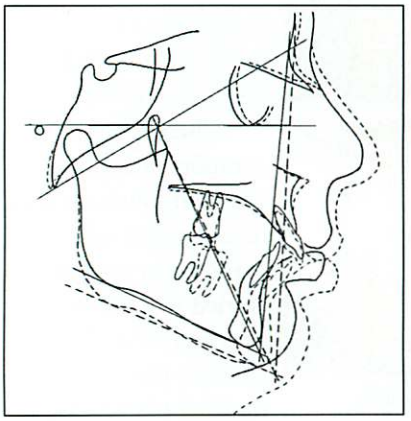
Separators are placed one week prior to fitting bands on all first molars. Simple alginate impressions are obtained and used to provide the lab with maxillary and mandibular working models. It is not necessary to obtain a wax construction bite with the banded Herbst. The clinician can simply indicate on the models with pencil lines where the mandible should be advanced relative to the maxilla. A detailed prescription sheet should be filled out, indicating optional items as needed, such as expansion screws, archwire tubes and occlusal rests. Separators are replaced one week before appliance insertion.

Appliance Delivery and Adjustments

The maxillary component and attached tubes are tried in as a single unit. The mandibular component is tried in without the pins attached. The pins are then placed through the tubes and secured to the mandibular component with the hex screws. The extensions of the pins through the distal aspect of the tubes are checked for impingement and the bite is verified. Although pins that are too long can lead to serious soft tissue injury, pins that are too short will result in disengagement of the telescoping mechanism upon wide opening. The appliance is removed in reverse order in preparation for cementation with Fuji Ortho LC. A small drop of Ceka Bond adhesive is placed on the end of the screws prior to securing them in place. This "lock-tight" material decreases the chance of a screw loosening, however, screw removal with an Allen wrench breaks the seal. The appliance may by activated by adding advancement shims to the pins, or if necessary, sub-

Figure 6: A, Pre-treatment cephalometric radiograph.

Figure 6: B, Post-treatment cephalometric radiograph.



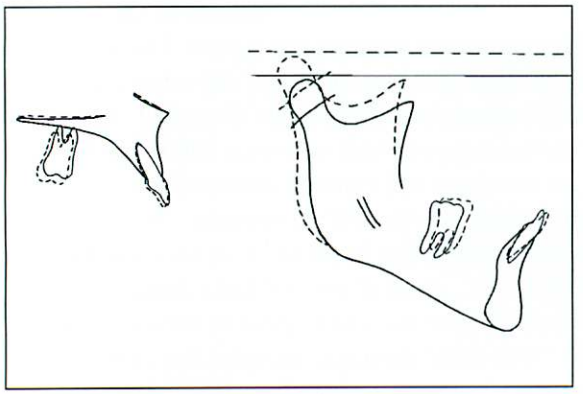


Figure 7: Cephalometric superimpositions.

stituting longer tubes. In fact, the amount of activation can differ between the sides when a midline deviation needs correction.

Treatment Effects

The treatment effects of the Herbst appliance have been well documented. McNamara and Howe[5] reported on the acrylic splint Herbst appliance. Weislander[11] reported on the cast Herbst appliance. Pancherz[8] has provided the best documentation of the treatment effects produced by the banded Herbst appliance. In his 1982 article, he evaluated 42 Class II, division 1 cases. Twenty-two patients were treated with the Herbst appliance for six months and the remaining 20 subjects served as controls. All 22 treated patients had a Class I dental relationship at the end of the six-month treatment period. This change was equally divided between skeletal and dental adaptations. The following case report highlights the treatment effects of the Herbst appliance.

Case Report, S.T.

A thirteen-year-old boy presented with a dentoskeletal Class II discrepancy and dental deepbite (Figure 3). Limited fixed appliances were used to intrude the maxillary incisors and rotate the maxillary first molars in preparation for Herbst appliance treatment. A wire-reinforced banded Herbst was delivered eight months later (Figure 4). The Herbst appliance was then worn for sixteen months, resulting in complete correction of the dental discrepancy (Figure 5). Radiographic evaluation (Figure 6) and cephalometric superimposition (Figure 7) reveal both a dental and skeletal contribution to Class II correction. The ANB angle was reduced from 7 to 4 degrees. The dental effect was similar to that of Class II elastics. The patient is now ready for Phase II treatment aimed primarily at maxillary space closure.

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