A Clip-On Fixed-Functional Appliance

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Many different treatment options are now available to correct Class II malocclusions without relying on patient cooperation. Such "non-compliance" devices include the Jasper Jumper,*[1] the Pendulum appliance,**[2] the Eureka Spring,***[3] the Jones Jig,*[4] the Distal Jet,*[5] and the Herbst appliance.†[6]

Although the original twin-block appliance was removable,[7,8] its effectiveness prompted us to develop a fixed twin-block system that would not require patient compliance. At first, the blocks were permanently affixed to the bands, but these proved difficult to cement to the teeth. The next stage was an appliance that could be removed by the clinician, but not by the patient. This led to a clip-on/clip-off appliance in which the acrylic twin blocks are attached to the bands with Wilson 3D†† Lingual Tubes and 3D Sectionals.

The clip-on twin blocks can be used alone as a functional appliance to correct the Class II problem, with the fixed appliance placed later in treatment. Another alternative is to use the twin blocks in conjunction with an existing full-bonded appliance.

Appliance Construction

The construction of the clip-on fixed-functional appliance, modified from previous descriptions,[9,10] is as follows:

First Visit

Separate the teeth to which the appliance will be banded—the upper first molars and the lower first or second premolars. Poorly fitted bands are one of the most common causes of failure, particularly on the lower premolars.

Second Visit

1. Select the upper and lower bands.
2. Weld 3D Wilson attachments to the upper bands (Fig. 1A).
3. Cement the upper bands to the molars (Fig. 1B).
4. Send the lower bands to the laboratory for attachment of the 3D Wilson Lingual and Buccal Tube assemblies, which are used to secure the acrylic occlusal blocks.

Third Visit

1. Cement the lower bands to the premolars (Fig. 1C).
2. Cover the 3D Lingual Tubes with wax.
3. Insert the 3D Transfer Inserts into the 3D Lingual Tubes (Fig. 1D). The loose positioning posts for the 3D Transfer System are not the same as the friction-fit posts of the 3D fixed appliances.
4. Take impressions with the 3D Transfer Inserts in place (Fig. 1E). The 3D Transfer System improves the fit of the acrylic blocks and considerably reduces chairtime.
5. Take a construction bite at about 75-80% of

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†Registered trademark of Dentaurum, Inc., 10 Pheasant Run, Newtown, PA 18940; www.dentaurum.de.
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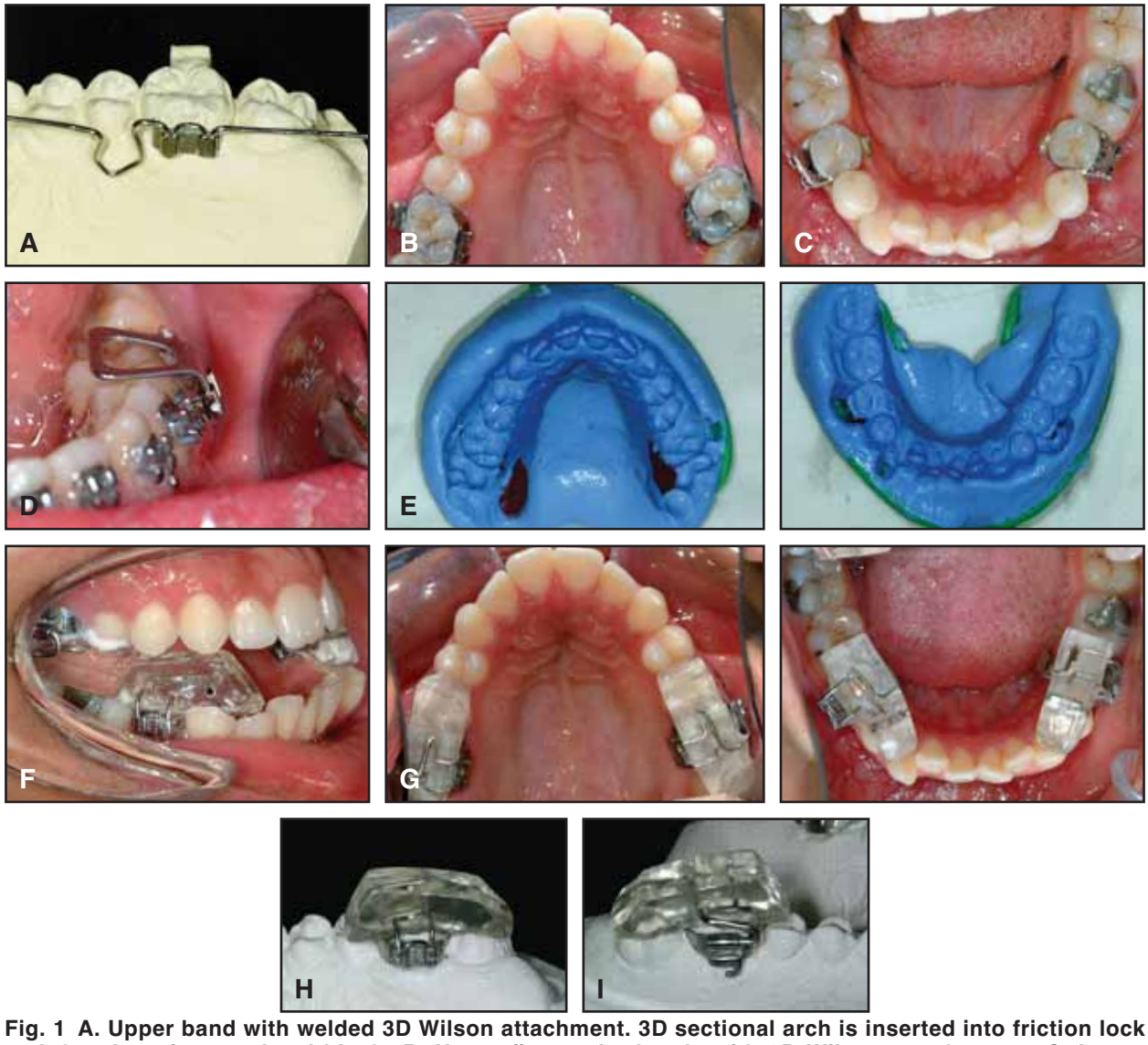

Fig. 1 A. Upper band with welded 3D Wilson attachment. 3D sectional arch is inserted into friction lock and then bent into occlusal block. B. Upper first molar bands with 3D Wilson attachments. C. Lower second premolar bands with 3D Wilson Lingual and Buccal Tube attachments. D. 3D Transfer Insert in Lingual Tube. E. Impressions taken with 3D Transfer Inserts in place. F. Occlusal blocks attached to 3D Buccal Tubes. G. Twin blocks seated into 3D Lingual Tubes. H. Occlusal block with 3D Lingual Tube attachment. I. Occlusal block with 3D Buccal Tube attachment.

maximum protrusion. With an overjet as great as 6-7mm, this will probably mean placing the incisors edge to edge. The posterior bite opening should be at least 5mm. If necessary, the appliance can easily be reactivated by adding acrylic during treatment.

6. Send the impressions and bite registration to the laboratory for construction of the occlusal blocks.

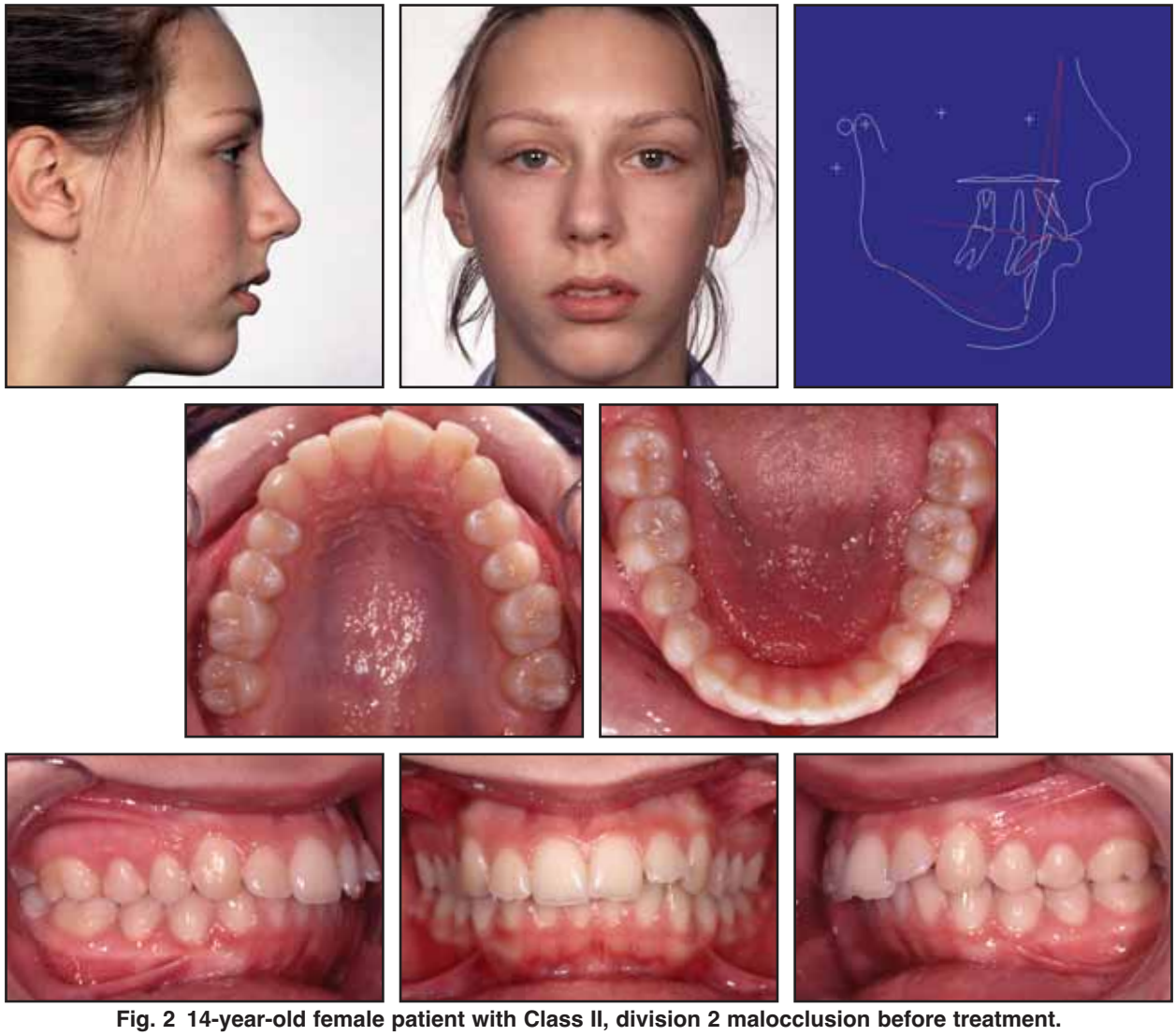

Fig. 2 14-year-old female patient with Class II, division 2 malocclusion before treatment.

Fourth Visit

1. Attach the acrylic blocks to the bands with the 3D Lingual and Buccal Tube assemblies (Fig. 1F).
2. Each block is inserted into the Buccal Tube and then rotated to seat it into the Lingual Tube (Fig. 1G).

The 3D Lingual Tube (Fig. 1H) has a wider base than the Buccal Tube (Fig. 1I), ensuring a better attachment to the band, and a twin tube that adds stability for solid anchorage and better control of rotation, torque, and tip. The twin tube also provides friction-lock security for the archwire, minimizing free play and eliminating the need for the extension lock that would be required with a single lingual tube. The twin tubes are lined up with each other and not contoured to the tooth, thus allowing easy

Fig. 3 Clip-on fixed-functional appliance in place.

Fig. 4 Fixed appliance after four months of treatment with clip-on fixed-functional appliance.

insertion of the twin-block posts.

Earlier designs used a lingual arch between the lower first premolars to stabilize the mandibular dentition and prevent expansion. The lingual arch is not necessary, however, if a lower fixed appliance is to be placed shortly after the fixed-functional.

Case Report

A 14-year-old female presented with the chief complaint that her upper anterior teeth were not straight. She had a Class II, division 2 malocclusion on a moderate skeletal Class II base, with a reduced Frankfort-mandibular plane angle and short lower face (Fig. 2). All permanent teeth were present except for the third molars.

The overjet was 6mm, and the overbite was complete. There was mild crowding in the upper anterior segment, but the lower anterior teeth were reasonably well aligned. The lower dental midline was 4mm to the left of the facial midline. The molar relationship was Class I on the right and a full-unit Class II on the left.

The treatment plan was to:

1. Correct the Class II malocclusion with a clip-on fixed-functional appliance.
2. Correct the lower midline with asymmetrical twin blocks.
3. Begin leveling and alignment with fixed appliances as the functional phase progressed.

Both arches were bonded to align the teeth and procline the upper anterior segment. Two months later, a clip-on fixed-functional appliance was fabricated as described above, with a layer of glass ionomer cement added between the acrylic blocks and the teeth (Fig. 3).

After another two weeks, the blocks were unclipped to check the amount of tooth movement. The blocks are easily clipped back into position by the clinician. A month later, the overjet had been reduced to 4mm, and acrylic was added to the left block to correct the asymmetry. One month later, the lower midline discrepancy had improved by 2mm.

Another month later, the incisor relationship was edge-to-edge, the midline discrepancy had

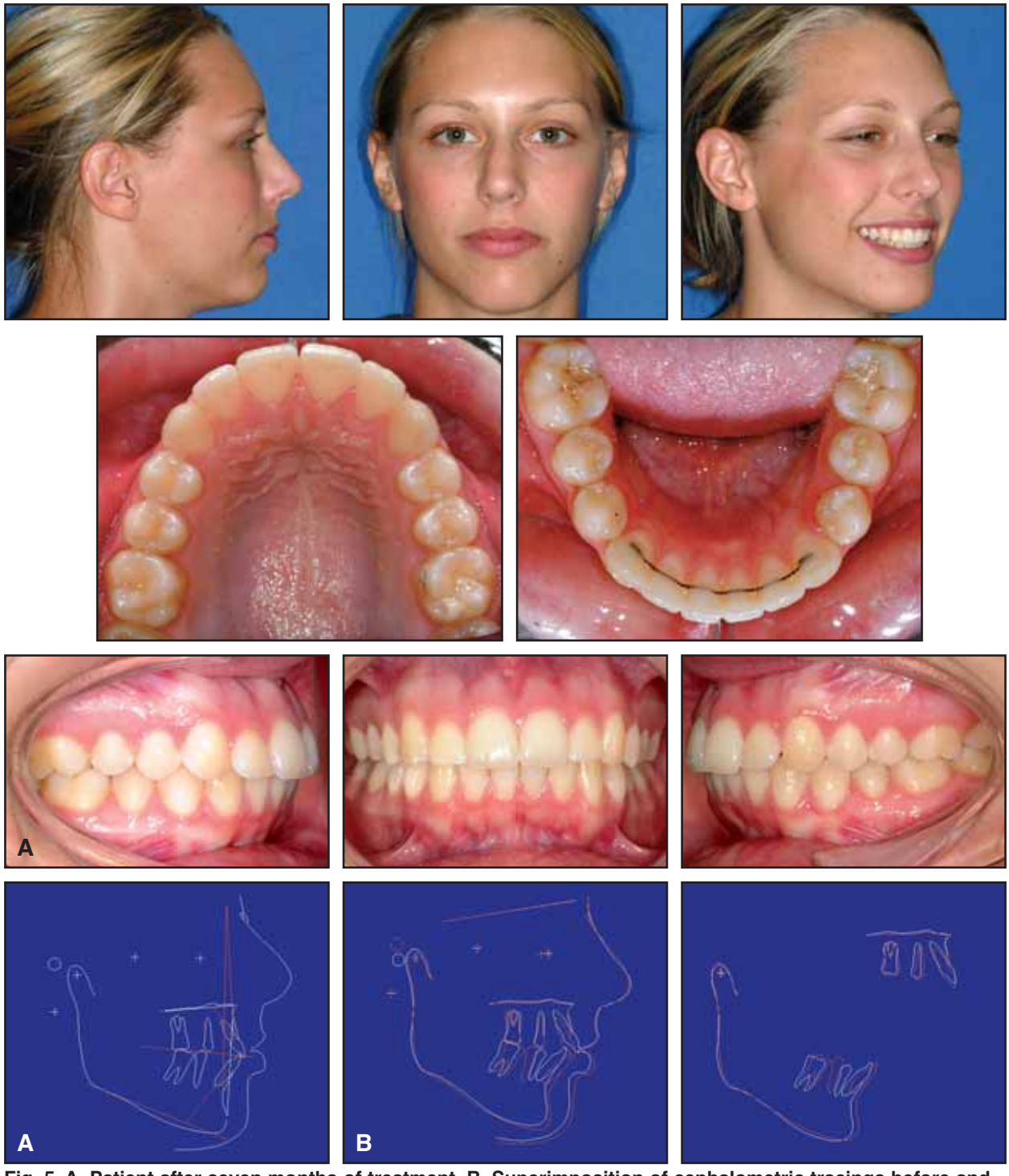

Fig. 5 A. Patient after seven months of treatment. B. Superimposition of cephalometric tracings before and after treatment.

been corrected, and there was a bilateral posterior open bite. With the functional stage completed, the twin blocks were removed (Fig. 4). After one month, the overjet had increased to 2mm, and the posterior open bite had closed considerably.

The patient then progressed through a series of upper and lower archwires to rectangular wires. The total treatment time was seven months, including four months of functional treatment with the acrylic blocks in place (Fig. 5). A bonded lower lingual retainer and removable upper Hawley-type retainer were delivered.

Discussion

The most important advantage of the clip-on fixed-functional appliance over removable twin blocks is that it is worn full-time, regardless of patient cooperation. In addition, it can be fully integrated with any fixed appliance system, thus reducing treatment time, and it can be used asymmetrically for midline corrections. The twin blocks should not be worn by patients who play contact sports. Although eating with the appliance in place can be cumbersome at first, patients soon get used to it. Oral hygiene is somewhat difficult in the lower lingual area, but has not been a problem.

Other Class II "non-compliance" systems, such as the Herbst appliance, the Mandibular Protraction Appliance,[11] and the Jasper Jumper, require fixed attachments between the upper and lower arches. Some clinicians have been hesitant to use these powerful devices because of concerns about breakage and restricted opening. By contrast, the clip-on fixed-functional appliance allows a comfortable range of jaw movement, and because the two halves are not attached, there are no leverage forces exerted on the connecting points. During biting and chewing, if the acrylic blocks fit accurately, the forces of occlusion are largely transmitted to the occlusal surfaces of the teeth. Furthermore, the appliance is not confined by the cheeks, which should also improve durability and patient comfort. Of the 140 patients we have treated to date with the clip-on fixed-functional appliance, only one has requested that it be removed.

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