The Modified Twin Block Appliance in the Treatment of Class II Division 2 Malocclusions

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Abstract. Two case reports illustrate the effective treatment of Class II division 2 malocclusion with modifications to the Twin Block appliance. This approach may reduce the total treatment time and reduce the need for extra-oral anchorage. In each of the cases presented treatment has been carried out on a non-extraction basis with full correction of the malocclusion.

Index words: Class II division 2 malocclusion, Class II skeletal base, Functional appliance, Modified Twin Blocks.

Literature review

The Class II division 2 malocclusion is a clinical entity, which presents considerable difficulty in the provision of a stable result (Selwyn Barnett, 1991). The success of treatment lies in correction of the transverse, anterior-posterior and vertical discrepancies. Furthermore, the importance of correcting the inter-incisal angle and edge centroid relationship is paramount for stability (Houston and Tulley, 1993). In order to achieve this Houston (1989) stated that it is essential to reduce the inter-incisal angle towards 125 degrees, bringing the lower incisor tip anterior to the upper incisor centroid. This is also evident from the results of an earlier study of 60 treated patients by Mills (1973) who concluded that stability was dependent on satisfactory reduction of the inter-incisal angle and the overbite.

The Twin Block developed by Clark (1982), has proved a popular and clinically successful appliance. With improved patient co-operation and increased daily wear correction of a sagittal discrepancy is possible in many patients within a 6–9-month period. Few clinical investigations of treatment effects of the Twin Block appliance have been published.

Studies comparing consecutively treated cases with the Twin Block appliance and control groups (Lund and Sandler, 1998; Mills and McCulloch, 1998; Trenmouth, 2000) demonstrated small, but significant increases in mandibular length. However, the majority of overjet correction occurring by dentoalveolar movement. Trenmouth (2000) suggests that the variation in the degree of incisal changes produced by the Twin Block appliances used in these studies is due to the differences in the clinical design of the appliances used.

Studies comparing the Twin Block appliance to other functional appliances (Illing et al., 1998; Toth and McNamara, 1999) demonstrated that compared to the Bass appliance, Bionator and Frankel, Twin Blocks appear to be the most effective in producing sagittal and vertical changes. These changes are achieved through mandibular skeletal and dentoalveolar changes in addition to normal growth.

There are no reports in the literature of the use of Twin Blocks in the treatment of Class II division 2 malocclusions. This paper demonstrates that a modified Twin Block appliance can be successfully used to treat Class II division 2 malocclusions from the outset. This avoids the need for an initial period of upper labial segment alignment, which would increase the overall length of treatment. Sagittal correction of the malocclusion is initiated alongside the correction of the retroclined upper labial segment.

Patient selection and bite registration

Patients who may be considered for this modified Twin Block technique are those with a Class II division 2 incisor relationship on a moderate Class II skeletal base with an ANB of 6–9 degrees. The buccal segment relationship
should ideally be at least half a unit Class II and the patient should have potential for further facial growth. Cephalometric analysis is carried out to confirm that the lower incisors can be proclined during treatment of the malocclusion. The axial inclination of the upper incisors is corrected initially by labial tipping and this corrected inclination is maintained during further correction of the malocclusion.

The bite registration is taken with the buccal segment relationship in an over corrected position, this may result in an edge-to-edge incisor position or a slight reversed overjet. However, by ensuring that there is 7–8 mm of separation in the buccal segments, there should be no incisal interference as the upper labial segment is proclined. It is also essential to have sufficient height of the blocks to ensure that the patient is more comfortable posturing forwards than closing in centric relation.

The appliance design

Both appliances are modifications of the Clark Twin Block (Clark, 1982). They have Adams clasps on maxillary and mandibular first molars and first premolars (maxillary canines in the first case), and ball ended clasps on the lower labial segment. The upper block contains a midline expansion screw. The inclined planes are constructed at 70 degrees to the occlusal plane. Advancement, if required is carried out by the addition of small acrylic tablets to the upper block. The additional modifications for each case are detailed as follows:

1. addition of one anterior screw with torquing spurs to both upper central incisors (Figure 2);
2. a double cantilever spring behind the upper labial segment (Figure 3), followed by bonding of the upper labial segment with pre-adjusted Edgewise fixed appliances.

Case report 1 (SR)

A 13½-year-old female was referred by her GDP. She presented with a Class II division 2 incisal relationship on a moderate Class II skeletal base, with mandibular retrognathia. All permanent teeth were present; however, the upper left second deciduous molar was retained. There was mild crowding in the labial segments. In occlusion the overbite was 10 mm and, complete, the overjet was 5 mm. The buccal segment relationship was a full unit Class II bilaterally. The cephalometric tracing confirmed that the
The patient had a moderate Class II skeletal base relationship with an ANB value of 8.0 degrees; the mandibular planes angle was 22.5 degrees. The upper incisors were retroclined at 74.5 degrees, with the lower incisors retroclined at 89.0 degrees. The inter-incisal angle was 174 degrees (Figure 4).

Treatment involved correcting the Class II skeletal relationship with a Twin Block appliance with simultaneous proclination of the upper labial segment, using an anterior screw palatal to both upper central incisors and torquing spurs (Figure 5).

Twin Block appliances were fitted and instructions given to turn the anterior screw and mid-line screw both once a week, but not simultaneously. The torquing springs were reactivated as required, and the buccal blocks were trimmed posteriorly to allow buccal eruption and reactivated anteriorly to continue antero-posterior correction.

Antero-posterior correction of the buccal segments was achieved after 8 months full time wear, at which stage the upper incisors had been proclined by 18.0 degrees and the ANB reduced by 3 degrees. Superimposition revealed mandibular changes in a horizontal and vertical direction, with an increase in lower anterior face height of 7.5 mm (Figure 6).

In occlusion there were substantial lateral open bites and minimal functional occlusal contacts (Figure 7). During the transition into fixed appliances an inclined clip over bite plane was worn full time, until upper and lower 0.019 × 0.025-inch stainless steel archwires were in place and
correction of the lateral open bites by buccal segment eruption was achieved. A fully bonded pre-adjusted Edge-wise appliance (Figure 8) was fitted to produce a mutually protected functional occlusion (Figure 9). Total treatment time was 38 months with a reduction in the PAR score from 33 to 2.

Pre-debond cephalometric analysis revealed correction of the upper incisor inclination to 108.5 degrees, the lowers to 101.5 degrees. The reduction in the ANB had improved to 3-5 degrees mainly by an increase in SNB. SNA remained at its post-functional value of 79.0 degrees (Figure 10; Table 1).

At no stage during the treatment did this patient need headgear, and Class II and Class III asymmetric elastics were employed for a 3-month period only to aid centreline correction in the final stage of treatment.

**Case report 2 (TD)**

A 14-year-old male was referred by his dentist who was concerned about the appearance of his upper incisors. He presented with a Class II division 2 incisor relationship on a moderate Skeletal II base with mandibular retrognathia. He had a full complement of teeth with mild crowding of the upper and lower labial segments. In occlusion the overbite was 10 mm and, complete to hard tissue, the overjet was 2 mm. The buccal segment relationship was half a unit Class II on the right and a full unit Class II on the left (Figure 11).

Cephalometric analysis confirmed a moderate Class II skeletal pattern with mandibular retrognathia and an ANB of 8.5 degrees. The mandibular planes angle was reduced at 17.5 degrees and the upper incisors retroclined at 80 degrees.

The aim of treatment was to achieve sagittal correction with Twin Blocks. Modified Twin Blocks with a double cantilever spring to procline the upper labial segment and high pull headgear to flying headgear tubes in the maxillary second premolar regions were fitted (Figure 12). Following excellent patient co-operation the upper labial segment was proclined and the buccal segment relationship was overcorrected in 15 months. This was confirmed cephalometrically with a 5-degree reduction in ANB due to an increase in SNB and proclination of the upper labial segment by 27.5 degrees (Figure 13).

Sectional fixed appliances were then placed on upper and lower labial segments due to fracture of the double cantilever spring on the upper Twin Block (Figure 14). After 15 months of twin block therapy full pre-adjusted Edgewise appliances were placed (Figure 15).
Following treatment the patient’s facial appearance has improved with the mandible appearing less retrognathic and the lower anterior face height increased. The teeth have been aligned, the buccal segment relationship is now Class I and the inclination of the upper labial segment has been corrected (Figure 16). Treatment was completed in 34 months with a change in PAR score from 45 to 2.

Cephalometric analysis revealed that sagittal correction occurred due to an anterior repositioning of B point with no evidence of maxillary restraint. The upper labial segment was proclined at 113.5 degrees the lower proclined to 104.5 degrees and inter-incisal angle of 122.5 degrees was achieved. (Figure 17; Table 2)
Discussion

There are obvious advantages of treating Class II division 2 patients with one removable functional appliance prior to fixed appliance therapy. Treatment time may be significantly reduced by eliminating a pre-functional phase of treatment. As advancement of the upper labial segment occurs simultaneously with sagittal correction the patient should never have an increased overjet placing them at risk of trauma due to prominent upper incisors. This technique also prevents patients being left with an increased overjet if they fail to comply with the functional phase following upper incisor proclination.

Various additions to the upper Twin Block are available for proclination of the upper incisors. In these two cases an anterior screw with torquing spurs on the maxillary central incisors and a double cantilever spring have been used. However, T or Z springs could also be used to provide this movement. In the second case sectional fixed appliances were placed following fracture of the double cantilever spring. This works best when the lateral incisors are proclined and the central incisors retroclined, and allows immediate levelling and aligning of the upper labial segment. Placing light wires allows alignment, but no major

Fig. 9 Case report 1: end of treatment records.

Fig. 10 Case report 1: pre-treatment (black) and end of treatment (red) cephalometric tracings superimposed on SN at sella.
Fig. 11  Case report 2: start records.

Fig. 12  Case report 2: Modified Twin Blocks.
torque effects would be expected at this stage. It also allows the patient to adjust to the upper fixed appliance and the clinician to monitor their effectiveness at oral hygiene measures. Placement of sectional fixed appliances proved to be extremely effective in the second case and the upper labial segment was proclined by 27.5 degrees from 80 degrees to 107.5 degrees. With sufficient retention of the Twin Blocks it would be possible to bond the labial segments from the outset and commence correction of their inclination early in treatment. The transition into fixed appliances is also enhanced as alignment has already occurred and progression through the archwires is quicker.

During treatment it is essential to take accurate measurements to monitor progress of the treatment. As upper incisor proclination is occurring concurrently with sagittal correction it is not possible to measure the overjet or reversed overjet accurately. Therefore, the buccal segment relationship should be recorded and also the separation of the blocks as the patient postures further forwards. Occasionally, it is not always possible to achieve the required sagittal correction without further advancement of the appliances. If this is required preformed acrylic tablets of various dimensions may be bonded to the upper block with a fast setting cold-cure acrylic resin.

Success with this treatment result depends upon slight over-correction of the buccal segments (molars and canines) to a ‘super’ Class I, which builds anchorage into the system prior to placement of the fixed appliances and allows for slight rebound. Class II correction is maintained with an inclined clip over bite plane, during the transition to fixed appliances. Lateral open bite reduction is commenced in the Twin Block phase by removal of the lower Adams clasps and

Fig. 13  Case report 2: pre-treatment (black) and end of Twin Blocks treatment (blue) cephalometric tracings superimposed on SN at sella.

Fig. 14  Case report 2: sectional appliances.

Fig. 15  Case report 2: pre-adjusted Edgewise appliances.
judicious trimming of the upper blocks. Any residual open bites, characteristically seen at the end of the functional phase, will correct by buccal segment eruption during the levelling and aligning phase. In these two cases, we found no need for seating/box elastics to aid this differential eruption.

Conclusions

Modification of the Twin Block appliance to provide active labial segment proclination, has eliminated the need for a pre-functional phase of treatment. This useful technique has proved to be efficient and effective in the treatment of Class II division 2 malocclusions.

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FIG. 17 Case report 2: pre-treatment (black) and end of treatment (red) cephalometric tracings superimposed on SN at sella.