Use of Twin Block of Clark in Management of Angle’s Class II Division I Malocclusion

Case Report

Gerald Ikenna Iseke, B.D.S., F.M.C.D.S.; Oluranti Olatokunbo daCosta, B.D.S., F.W.A.C.S.

ABSTRACT
A case report on the orthodontic management of a 10-year-old female patient with Angle’s Class II Division I malocclusion, 12 mm overjet, incompetent lips, a deep bite and a lower midline shift to the right using the Twin Block of Clark is presented. Treatment objectives included reduction of the overjet and overbite, obtaining a Class I molar and canine relationship, and improving the patient’s profile. After a thorough patient assessment, a two-phase orthodontic treatment plan was chosen with myofunctional therapy using the Twin Block constituting the first phase of treatment. Second phase of treatment was to be carried out using a preadjusted edgewise appliance system. Active treatment with the Twin Block lasted for nine months. Patient’s compliance with the appliance was good, and an overjet reduction to 4.5 mm was achieved with an improvement in facial profile after the first phase of treatment. The Twin Block of Clark is a very good treatment alternative in managing selected cases of Angle’s Class II Division I malocclusion.

Class II malocclusion presents in a wide variety of skeletal and dental configurations. The most consistent diagnostic finding in these patients is mandibular skeletal retrusion. Several treatment options are available for managing Class II malocclusions; among these is the use of functional appliances. Functional appliances encompass a range of removable and fixed devices that are designed to alter the position of the mandible, both sagittally and vertically, to induce supplementary lengthening of the mandible by stimulating increased growth at the condylar cartilage.

The Twin block (TB) appliance, originally developed by Clark, is a widely used functional appliance for the management of Class II malocclusion. Its popularity is attributed to its high patient adaptability and ability to produce rapid treatment changes. The appliance consists of maxillary and mandibular acrylic plates with bite blocks, which interlock at a 70-degree angle on closure, while posturing the mandible forward.

Two main schools of thought exist with regard to the timing and choice of orthodontic treatment for children presenting with Angle’s Class II Division I malocclusion. One advocates an early or two-phase treatment in which the first phase commences in the mixed dentition using appliances such as the TB or other functional appliances to achieve growth modification while a second phase of treatment commences in the permanent dentition using fixed appliance therapy. The other school of thought advocates a one-phase or delayed/late treatment in which treatment is delayed until the early permanent dentition, when fixed appliance
therapy is used. A two-phase treatment plan reduces the risk of maxillary incisor trauma and need for orthognathic surgery at a later stage. In addition, the time spent in fixed appliance therapy is much shorter in children who undergo the two-phase treatment.8-10

This case report demonstrates management of a patient with a Class II Division I incisal relationship, using a two-phase treatment plan, with successful completion of the first phase of treatment using the TB appliance.

Case Report
The patient is a Pakistani girl, aged 10 years, 7 months. She was referred to the orthodontic clinic of the Child Dental Health Department of the Lagos University Teaching Hospital, Iddi-araba. Her chief complaint was that she was unhappy with her teeth, as the top ones “stuck out.”

On extraoral examination, the patient presented with a skeletal base II. She had a convex soft tissue profile with mandibular retrusion. Her lips were grossly incompetent (Jackson’s classification I/0) with a prominent mentolabial depression. There was no transverse asymmetry when viewed frontally (Figure 1).

On intraoral examination, the patient was in mixed dentition. The oral hygiene was fair. She had a Class II Division I incisor relationship, while her molar relationship was Angle’s Class II Division I, sub-division left. She had a 12 mm overjet, and her overbite was incomplete and increased. She presented with mild spacing of the upper labial segment (4 mm) and very mild crowding of the lower labial segment (1 mm). The upper and lower posterior segments were in normal alignment. With respect to the arch width, the upper arch was constricted, while the lower arch was normal; however, there were no crossbites. Both maxillary canines were mesioplatally rotated, and she had a lower midline shift to the right of 3 mm (Figure 2). The upper right first maxillary molar was carious. The patient had a digit sucking habit, which she started when she was toddler, but stopped when she was 4 years old.

Cephalometric findings were compared to normal values for a Pakistani population.11 The cephalometric analysis confirmed the clinical finding of a Class II skeletal base relationship with a retrusive mandible and ANB of 9 degrees. Both upper and lower incisors were proclined (Table 1).

Treatment Objectives
- Restoration of carious lesion on the upper right first maxillary molar.
- Reduce the overjet.
- Reduce the overbite.
- Improve the facial profile.
Improve lip competence.
Correct the spacing in the upper labial segment.
Resolve the crowding in the lower labial segment.
Correct the lower midline shift.
Obtain Class I molar and canine relationships.

Treatment Alternatives
- Commencing treatment immediately using “2-by-4” fixed appliance therapy (preadjusted edgewise system) while waiting for exfoliation of the second primary molars.
- Delaying treatment for a few months, after which comprehensive fixed appliance therapy is commenced with two-unit extraction and reinforced anchorage in the upper arch.
- Two-phase treatment consisting of removable appliance (Roberts retractor with an anterior bite plane) and then fixed appliance therapy using the preadjusted edgewise system.
- Two-phase treatment consisting of functional appliance and then fixed appliance therapy.

Treatment
After consultation with the patient, the last option, two-phase treatment with functional appliance and fixed appliance therapy, was selected. The carious lesion on the upper right maxillary molar was restored and oral prophylaxis carried out.

The following treatment records were obtained: clinical photographs, study and working models (Figures 1-3). Occlusal registration for construction of the TB (squash bite) was obtained using a wax wafer of 4 mm thickness, with the mandible in a protruded position and the incisors biting edge-to-edge. Working models were sent to the lab with the squash bite in place.

The appliance was fitted satisfactorily and post-insertion instructions were given. The patient was advised to wear the appliance for 24 hours a day and while eating, if possible (Figure 4).

Treatment Progress
A gradual reduction in the overjet was observed after a period of time, with an average overjet reduction of 1 mm per month commencing from the first month of treatment. The bite planes of the TB appliance had to be trimmed intermittently to allow for eruption of the lower first mandibular molars.

After nine months of treatment, the following was achieved (Figures 5, 6):
- Overjet reduction to 4.5 mm.
- Normal overbite achieved.
- Improvement in patient’s facial profile.
- Appliance left in the mouth for retention, pending commencement of second phase of treatment.

Discussion
This case shows a good treatment outcome for the first phase of treatment, which was achieved with the TB appliance. The success can be attributed to three factors, namely, proper patient selection—pubertal growth spurt, timing of treatment and patient compliance.

Current wisdom suggests that any attempt at growth modification should be undertaken at the peak of the pubertal growth spurt. The optimum timing for functional/orthopedic treatment of Class II malocclusion is during or slightly after the pubertal growth spurt. From the point of view of occlusal development, this period correlates in most patients with the late mixed or early permanent dentition. The patient in this case was in the late mixed dentition and, thus, at an ideal age to commence treatment.

Considering the fact that the TB appliance worn by the patient was a removable appliance, patient compliance was also a key factor to treatment success. A major advantage of the TB appliance is its relatively smaller size—it comes in two parts rather than as a mono bloc—compared to other functional appliances.

<table>
<thead>
<tr>
<th>TABLE 1</th>
<th>Pre-Treatment Cephalometric Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEASUREMENT</td>
<td>PATIENT</td>
</tr>
<tr>
<td>SNA</td>
<td>80°</td>
</tr>
<tr>
<td>SNB</td>
<td>71°</td>
</tr>
<tr>
<td>ANB</td>
<td>9°</td>
</tr>
<tr>
<td>UI to Frankfort plane</td>
<td>127°</td>
</tr>
<tr>
<td>LI to Mandibular plane</td>
<td>106°</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TABLE 2</th>
<th>Cephalometric Analysis: Comparison of Pre- and Post-Treatment Cephalometric Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEASUREMENT</td>
<td>PRE-TREATMENT</td>
</tr>
<tr>
<td>SNA</td>
<td>80°</td>
</tr>
<tr>
<td>SNB</td>
<td>71°</td>
</tr>
<tr>
<td>ANB</td>
<td>9°</td>
</tr>
<tr>
<td>UI to Frankfort plane</td>
<td>127°</td>
</tr>
<tr>
<td>LI to Mandibular plane</td>
<td>106°</td>
</tr>
</tbody>
</table>
This may also enhance patient compliance and minimize speech disturbance.\textsuperscript{14}

The positive outcome at the end of treatment can be attributed to skeletal and dentoalveolar changes produced by the TB appliance. Post-treatment, the patient experienced an increase in the SNB angle by one degree, from 71 degrees to 72 degrees; this was most likely a result of increased mandibular growth. In contrast, the patient experienced a slight inhibition of forward maxillary growth as the SNA reduced to 78 degrees at the end of treatment, from the pre-treatment value of 80 degrees (Table 2). This reduction in the SNA angle can be attributed to the “headgear effect” produced by the TB appliance.\textsuperscript{10} Mills and McCulloch,\textsuperscript{13} in a cephalometric study of the treatment effects of the TB appliance, reported a 1.9-degree increase in the SNB angle of the treatment group as compared to almost no change (0.3-degree increase) in the control group, while a 0.9-degree reduction was observed in the SNA, as compared to a +0.1-degree increase in the control subjects.

Post-treatment, a lingual tipping of the maxillary incisors was observed in this patient, with a reduction of incisor proclination from 127 degrees to a post-treatment value of 115 degrees (Table 2). This lingual tipping may be due to the labial bow in the TB appliance, which comes in contact with the maxillary incisors during sleep, causing them to retract.\textsuperscript{15} Others have also attributed it to the contact of the lip musculature during treatment.\textsuperscript{16}

Lund and Sandler\textsuperscript{17} achieved significant maxillary incisor retraction by incorporating a maxillary labial bow in the TB appliance, in contrast to Mills and McCulloch,\textsuperscript{14} who did not use a labial bow and found little change in the maxillary incisor position. Thus, the labial bow in the TB appliance plays an important role in the lingual tipping of the maxillary incisors.

A slight degree of mandibular incisor proclination was observed (2.5 degrees), with an increase in angulation from 106 degrees to a post-treatment value of 107.5 degrees (Table 2). This proclination is probably due to the mesial force on the mandibular incisors produced by protrusion of the mandible.\textsuperscript{1,16} Toth and McNamara\textsuperscript{16} reported a comparable value of mandibular incisor proclination of 2.8 degrees. Other authors\textsuperscript{24,17} have also reported values of 3.8 degrees and 7.9 degrees, respectively, after TB appliance therapy. However, lower incisor proclination, although helpful in achieving the initial overjet correction, is not a goal of functional appliance treatment. The more the lower incisors are proclined, the less possibility there is for skeletal correction of the overjet. In addition, labial tipping of lower incisors is not stable over the long term and is liable to relapse.\textsuperscript{8} For these reasons, lower incisor proclination is considered a limitation of using the TB appliance.

The reduction in overjet from 12 mm to 4.5 mm (Figure 8) can be attributed to the skeletal and dental changes highlighted above. Active treatment for this patient lasted for nine months, which is comparable to that reported in the literature of 6 to 15 months.\textsuperscript{8,14,18} The appliance was left in place for three months following treatment to act as a retainer, pending commencement of the second phase of treatment. At the end of the first phase of
treatment, due to the asymmetric molar relationship present at the start of treatment, the patient had a Class 1 molar relationship on the right, but was tending toward a Class III molar relationship on the left. This would be corrected during fixed appliance therapy in the second phase of treatment.

A second phase of treatment, using fixed appliance therapy, would be necessary to correct all other occlusal irregularities present and to obtain minor detailing of the occlusion. However, the use of a TB appliance in the first phase of treatment has reduced the expected duration of fixed appliance therapy in the second phase of treatment. The high risk of fracturing the maxillary incisors has also been reduced, while the patient’s facial aesthetics have been greatly improved within a reasonably short period of time without having to delay treatment until the early permanent dentition. In addition, the risk of external apical root resorption, which has been reported to be higher in one-phase than in two-phase treatments, has been reduced.9,19 Furthermore, the need for a two-unit extraction in the upper arch as part of the fixed appliance therapy or orthognathic surgery has been eliminated.

Conclusion
This case has demonstrated the successful management of the first phase of treatment of a patient with Angle’s Class II Division I malocclusion using the Twin Block of Clark.

Queries about this article can be sent to Dr. Isiekwe at ikisiekwe@yahoo.com.

REFERENCES