

CLINICAL  
SECTION

# Pseudo-Class III malocclusion treatment with Balters' Bionator

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## Abstract

*Index words:* Anterior crossbite, Bionator III, pseudo-Class III

The aim of this article is to show the use of the Balters' Bionator in pseudo-Class III treatment. The importance of differentiating between true Class III and pseudo-Class III is emphasized. The therapeutic results of a Balters' Bionator appliance are presented in three case reports of subjects in the mixed dentition. In this stage of development it is possible to correct an isolated problem. The use of the Bionator III in this kind of malocclusion enabled the correction of a dental malocclusion in a few months and therapeutic stability of a mesially-positioned mandible encouraging favourable skeletal growth.

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## Introduction

Skeletal, aesthetic, and occlusal characteristics of pseudo-Class III have been highlighted in different articles, and have been compared with normal occlusion, Class I malocclusion, or skeletal Class III malocclusion.<sup>1–3</sup>

The incidence of Class III malocclusion is variable and depends upon the different methods of classification used. Class III malocclusion in white subjects occurs in fewer than 1 per cent of the population, while frequency in the Japanese population is approximately 10 per cent.<sup>1</sup>

However, the incidence of pseudo-Class III malocclusion in a sample of 7096 Chinese children was estimated to be 2–3 per cent.

Nakasima<sup>1</sup> has reported that the incidence of anterior crossbites has a strong ethnic distribution, particularly high in Japanese subjects and Ferguson<sup>4</sup> has reported that an anterior crossbite could be observed in 3 per cent of patients in the United States.

## Dental features, diagnosis, and aetiology

Mesio-occlusion is an anteroposterior dentoalveolar relationship characterized by a more anterior position of the mandibular dentition compared to the maxillary dentition.<sup>1</sup> Clinically, there are two types of mesio-occlusion. The first type is considered to be a positional form, as a result of a mesial displacement of the mandible

into an anterior position and has been named in a different ways (pseudo, functional or apparent...). The other form of mesio-occlusion is a true skeletal Class III. The characteristics of this malocclusion result from a combination of skeletal and dentoalveolar features.

Careful clinical evaluation of Class III malocclusion always requires checking anterior and posterior dental relationships with the mandible in centric relation. Moyers proposed the pseudo-Class III relationship as a positional malocclusion with an acquired neuromuscular reflex, and considered the hypothesis that the positional relationship in 'apparent Class III' may occur with an early interference with the muscular reflex of mandibular closure.<sup>5</sup> Subjects with pseudo-Class III malocclusions mainly present with Class I or mild Class III skeletal relationships, while the mandible appears morphologically normal. However, anterior crossbite and negative overjet are constantly present due to the anterior mandibular displacement. Usually, the soft tissues tend to camouflage the skeletal discrepancy and the patient's profile appears normal or slightly concave in centric occlusion. Different aetiological factors have been suggested in pseudo-Class III malocclusion.<sup>6</sup>

### Dental factors

- Ectopic eruption of maxillary central incisors
- Premature loss of deciduous molars

*Functional factors*

- Anomalies in tongue position
- Neuromuscular features
- Naso-respiratory or airway problems

*Skeletal factors*

- Minor transverse maxillary discrepancy

It has also been suggested that these sequelae occur more frequently in subjects with a prognathic mandible (primary cause) and the mandibular shift can be considered a functional (environmental) factor, therefore the postnatal causative factors may not be the primary cause.<sup>1</sup>

### Management of pseudo-Class III malocclusion

The pseudo-Class III malocclusion involves both permanent teeth and the deciduous dentition.

Because a malocclusion may be regarded as an aesthetic problem, parents often inquire whether or not therapy might be required. Several clinicians believe in the advantages of early intervention and have suggested a number of reasons for early correction of anterior crossbite even in the deciduous dentition. The optimum period for the treatment suggested to be between the ages 6–9 years.<sup>7–10</sup>

Many practitioners however still avoid early correction of pseudo-Class III in the deciduous dentition because of poor stability of correction and unfavourable experiences with the behaviour of young patients. Patients may develop a crossbite once again during the transitional dentition, thus requiring further treatment and this may represent a possible disadvantage of treatment at early stage.

Some practitioners prefer to wait for the permanent maxillary incisors to erupt before initiating therapy due to the natural tendency of teeth to erupt in a lingual position during dental arch development. Sometimes, functional deciduous anterior crossbites occasionally correct themselves spontaneously.

White has suggested intervention in cases of pseudo-Class III malocclusion in the mixed dentition when the maxillary and mandibular incisors have erupted.<sup>12</sup> This allows the permanent teeth to erupt into a better position and improves the dental aesthetics.

The benefits attributed to the treatment of pseudo-Class III malocclusion in the mixed dentition are:

- preventing unfavourable growth of skeletal components (in fact, early treatment of anterior crossbite can help to minimize adaptations that are often seen in severe late adolescent malocclusion);<sup>2</sup>
- preventing functional posterior crossbite and habits, such as bruxism that can develop from anterior or posterior interferences;<sup>11</sup>
- gaining space for eruption of canines (lack of space could be caused by retro-inclination of upper incisors frequently found in pseudo or Class III malocclusion);<sup>3</sup>
- avoiding the risk of periodontal problems to mandibular incisors caused by the traumatic occlusion due to the crossbite.

### Use of Bionator in Pseudo-Class III malocclusion in mixed dentition

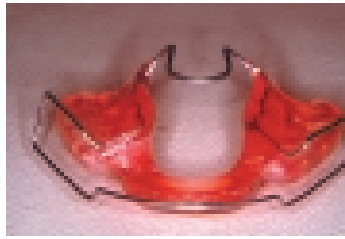
Several studies have suggested that almost 20 per cent of patients presenting with a Class III malocclusion can be treated during the mixed dentition. At this stage of development it is possible to correct an isolated problem or provide preliminary treatment.<sup>12,13</sup> Anterior crossbite in the mixed dentition should be corrected to allow normal dental development and subsequent favourable skeletal growth.

Studies have confirmed the efficiency of the Bionator in the treatment of Class III malocclusions. Clinical experience has shown the importance of differential diagnosis and suggested that individualization of the appliance is important for good results.<sup>14</sup> Functional orthopaedic appliance therapy is one approach to the treatment of pseudo-Class III malocclusion. The Bionator, developed by Balters is a derivative of the Activator.

His design has a palatal wire and also a wire with 'buccinator wings' to reduce cheek pressure, while the amount of acrylic is reduced. The Bionator can be worn both day and night.<sup>5</sup>

The reverse Bionator or Bionator III is a modified version of the traditional bionator and can be used in the treatment of Class III malocclusion. The modified Bionator differs in various characteristics from the original appliance. The lingual wire is in a different position to control the position of the tongue up to the upper first molar. The labial arch is placed in the middle of the lower teeth (Figure 1). The acrylic should be made as small as possible in order to occupy minimal space and should have a concave form to accommodate the tongue. The occlusal acrylic should be thick enough to obstruct tongue movement between the posterior segments.

The vertical occlusal height should be enough to correct



**Fig. 1** Balters' Bionator described in this article.

the anterior crossbite, but should not exceed 3–4 mm. The construction bite is taken by positioning the mandible posteriorly into centric relation.

Finally the acrylic vestibular lateral shields should be positioned to allow lateral alveolar growth in order to permit expansion of the maxillary arch.

## Case reports

### Case report 1

A female patient, age 8 years 10 months, presented with an anterior crossbite from the upper right deciduous canine to the upper left deciduous canine and a 1-mm deviation of the mandibular midline to the right (Figure 2). The patient had a good profile with a slight mid-face convexity and the lower lip appeared protruded (Figures 2 and 4). She was in the mixed dentition and the initial panoramic radiographs revealed that all permanent teeth were present. The upper anterior teeth were retroclined and the upper right lateral incisor was missing, while the lower anterior teeth were protrusive. The molars were in a Class I relationship. The lower arch was in the late mixed dentition and 'E' space was present; right and left mandibular second primary molars had exfoliated (Figure 2).

Pre-treatment cephalometric analysis showed an increased mandibular plane angle (40 degrees), with a normal ANB, but a high Wits measurement (–6 mm) and the lower incisor inclination was 29 degrees to NB. Angular and linear measurements of mandibular skeletal growth were normal. Clinical evaluation of the occlusal relationship in centric relation showed an early interference of the upper left central and lower left central incisors (Figure 3).

*Treatment progress.* An early treatment goal was to eliminate the mandibular displacement and treatment was initiated with a Balters' Bionator III. In order to construct the Bionator a wax bite was taken by distally repositioning the mandible in centric relation. This use of the Bionator III thus enabled the tongue to move freely

in the anterior part of the palate, pushing it against the upper front teeth. The vertical thickness of the bite was 3–4 mm with sliding guides in the posterior zone.

The patient had to wear this Bionator for 16 hours a day (Figure 4).

*Results.* The incisors were beyond edge-to-edge after 9 weeks, but use of the Class III Bionator was continued. Eleven months after the beginning of treatment the patient had a normal occlusion with 2-mm overjet and a Class I molar relationship. Final records showed excellent occlusal and aesthetic results, and the profile was relatively normal with a good lower lip position (Figure 5). Cephalometric tracing demonstrated a reduction of 3 mm in the Wits measurement and a retro-inclination of the lower incisors with a reduction of the angular and linear measurements (22 degrees, 3 mm to NB; Table 1).

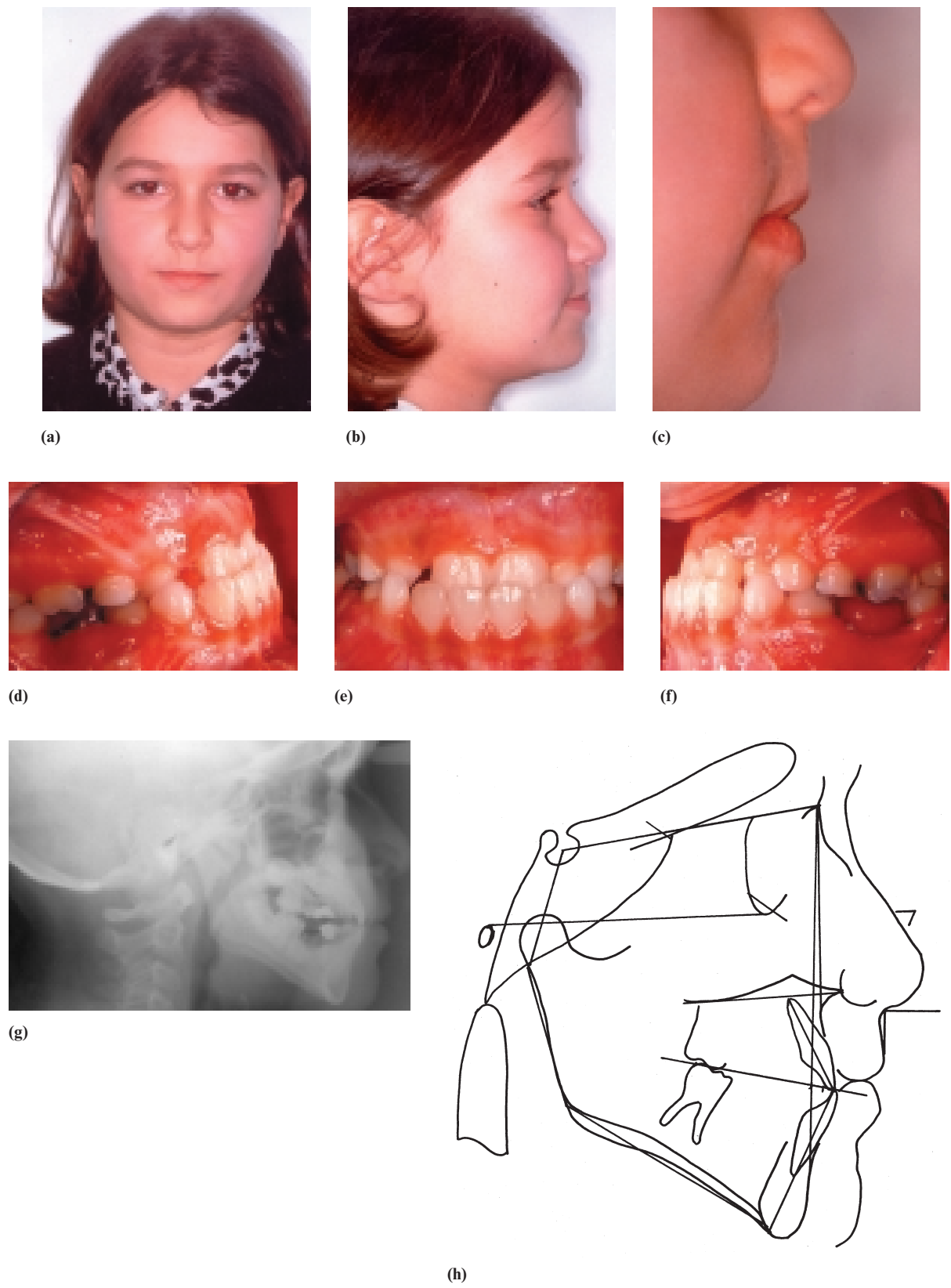
**Table 1** Case 1 cephalometric summary

Measurement	Normal	Initial	Final
SNGOGN	32°	40°	38°
PocGoGn	16°	20°	18°
FMA	25°	33°	33°
SNA	82°	81°	82°
SNB	80°	79°	80°
ANB	2°	2°	2°
AoBo	0.3 mm	–6 mm	–3 mm
1/NA	4 mm	3 mm	4 mm
1/NA	22°	29°	29°
1/NB	4 mm	5 mm	3 mm
1/NB	25°	29°	22°
FMIA	65°	63°	62°
IMPA	90°	84°	85°
1/1	131°	128°	130°
NLA	90°	90°	80°

### Case report 2

The second case report was a 9-year-old girl presenting a convex profile, protruding lower lip and anterior crossbite. She had a Class III malocclusion in the mixed dentition (Figure 6).

An anterior interference was evident when evaluating the occlusal relationship in centric occlusion (Figure 7). Cephalometric analysis revealed a Class I skeletal relationship with ANB = 2 degrees. Angular measurements of the maxilla could be considered normal, but linear measurements suggested mandibular protrusion



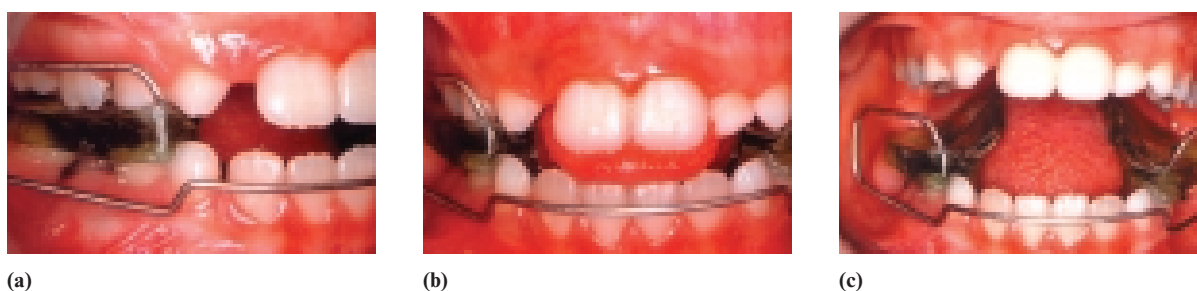
**Fig. 2** Case 1: pre-treatment records and cephalometric tracing.

(Wits = 5 degrees). Dental patterns revealed upper incisor retroclination (1 mm, 17 degrees to NA) and proclination of lower incisor (5 mm, 35 degrees to NB). The nasolabial angle was acute (Table 2).

**Treatment progress.** The objectives of the treatment were to procline the upper incisors, eliminate the mandibular displacement and create the space necessary for the eruption of the upper right lateral incisor. Because of skeletal Class III measurements we decided to use a functional appliance. A Class III Bionator was used for



**Fig. 3** Case 1: intra-oral view before treatment; an early interference of the upper and lower left central incisors in centric relationship is detected.



**Fig. 4** Case 1: intra-oral view during the treatment with Balter's Bionator.

14–16 hours a day for a period of 90 days (Figure 8).

At the end of the treatment period the following results were obtained: a labial inclination of the upper incisors possibly due to tongue pressure and a retroclination of the lower incisors due to the action of the Bionator wire. Both of these factors contributed to the correction of the anterior crossbite and the elimination of the mandibular displacement (Figure 9).

Also, the right buccal crossbite was eliminated by using occlusal ramps built up on the mandibular permanent and deciduous molars (Figure 10).

**Results.** After 24 months of treatment a good occlusion was achieved, with a Class I canine and molar relationship (Figure 11).

Cephalometric averages demonstrated little change of linear and angular mandibular measurements. The maxillary incisors were uprighted to 2 mm and 26 degrees to NA, while lower incisors were retroclined to 4 mm, 30 degrees to NB. The nasolabial angle increased up to 5 degrees, with a pleasing aesthetic effect on the profile (Table 2).

### Case report 3

A 9-year-old female presented with a retruded soft-tissue profile, normal facial growth with very little protrusion

**Table 2** Case 2 cephalometric summary

Measurement	Normal	Initial	Final
SNGOGN	32°	33°	33°
PocGoGn	16°	16°	11°
FMA	25°	26°	24°
SNA	82°	82°	83°
SNB	80°	80°	80°
ANB	2°	2°	3°
AoBo	0.3 mm	–5 mm	–3 mm
1/NA	4 mm	1 mm	2 mm
1/NA	22°	17°	26°
1/NB	4 mm	5 mm	4 mm
1/NB	25°	35°	30°
FMIA	65°	52°	58°
IMPA	90°	102°	98°
I/I	131°	126°	121°
NLA	90°	81°	86°

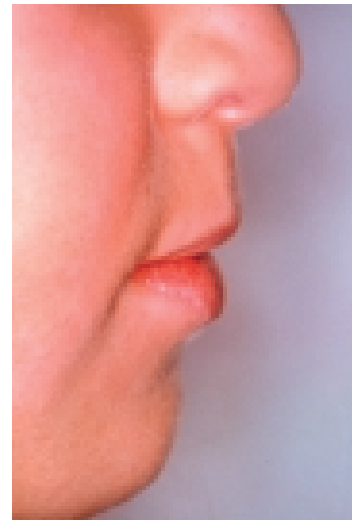
of mandible (Figure 12). The patient had a bilateral Class III malocclusion, which was more pronounced on the right side, and an anterior crossbite with a 4-mm deviation of the mandibular midline to the left. The upper anterior teeth were retroclined and a minor rotation of these teeth was visible.



(a)



(b)



(c)



(d)



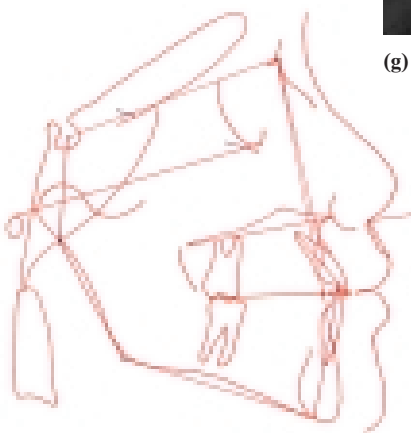
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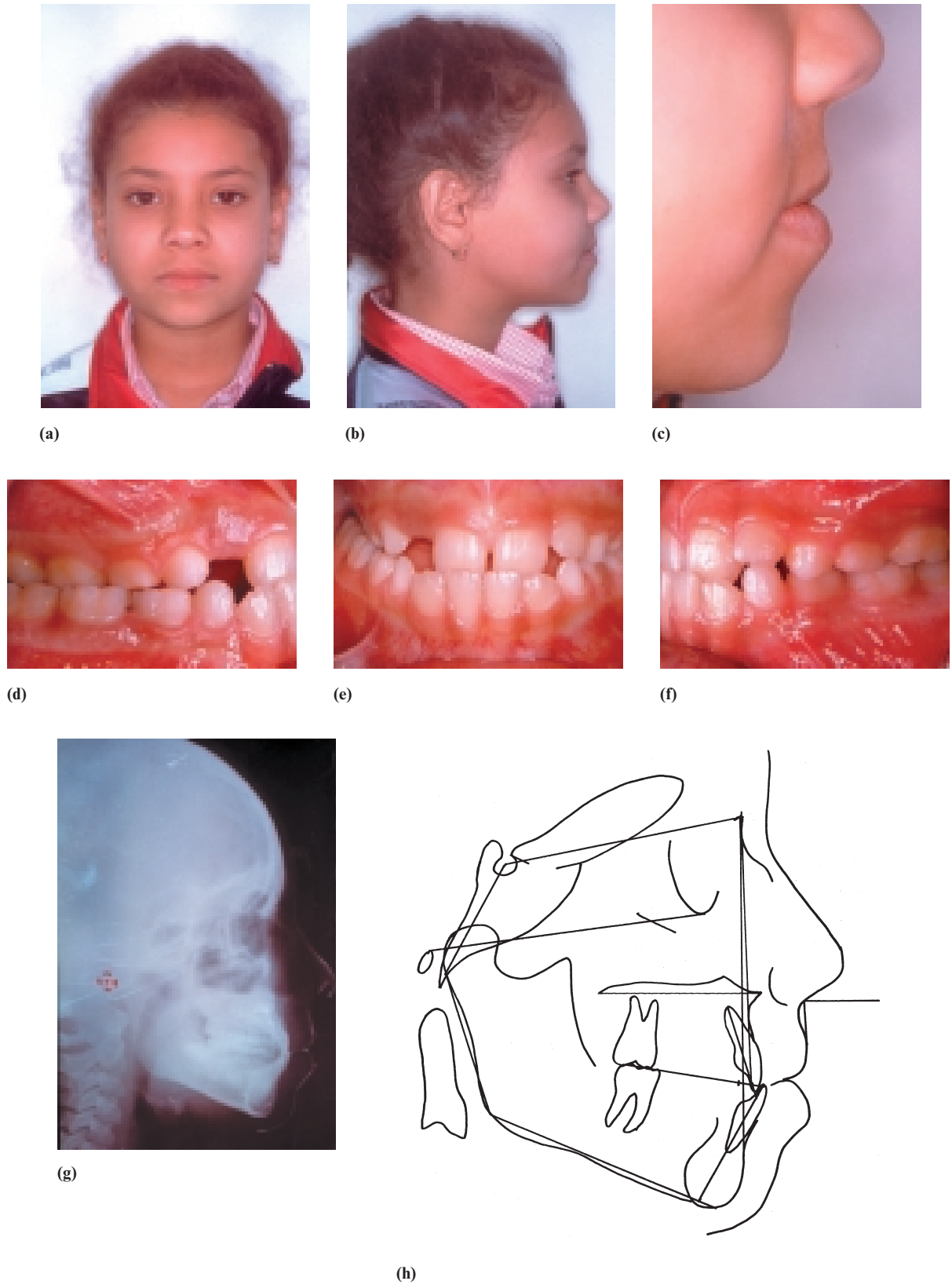


(h)



(i)

**Fig. 5** Case 1: post-treatment records, cephalometric tracing and superimposition after 11 months of active treatment.



**Fig. 6** Case 2: pre-treatment records and cephalometric tracing.

The lower anterior teeth were protruded and over-erupted.

Cephalometric analysis indicated a small Class III mal-occlusion characterized by a little mandibular protrusion (ANB =  $-1$  degree, Wits  $-6$  mm). The mandibular position was due to a premature of the left central incisors and subsequently mandibular displacement (Figure 13).

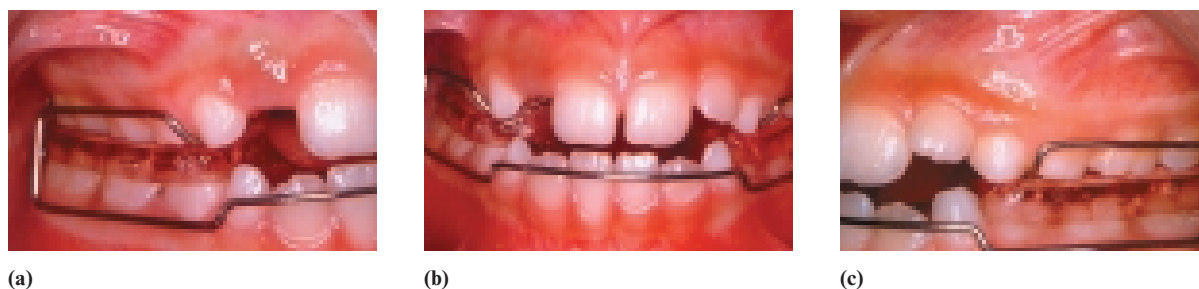
*Treatment progress.* The aims of this treatment were to obtain a Class I occlusion, correct the mandibular displacement and eliminate the premature contact between the two incisors. Due to the patient's age, it was advisable to use a functional appliance and a Bionator III was chosen. The patient was instructed to wear it for 15 hours a day (Figure 14).

*Results.* After only 2 months of therapy, the patient presented an edge-to-edge incisor relationship.

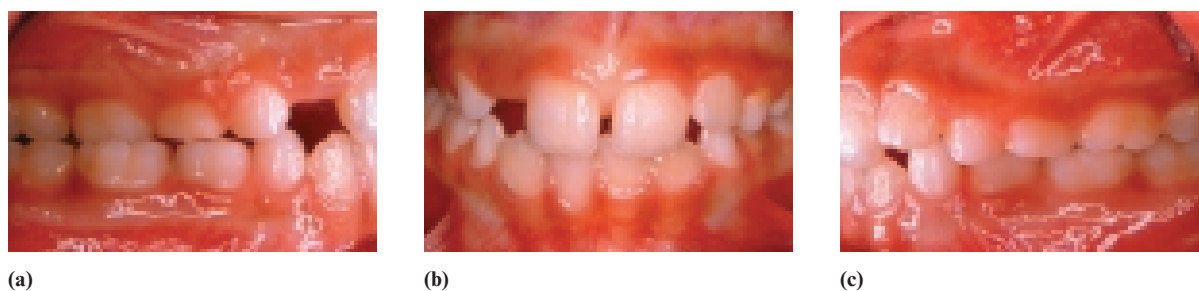
It was decided to continue the therapy in order to



**Fig. 7** Case 2: intra-oral view before treatment; an early interference of upper and lower right central incisors in centric relationship is detected.



**Fig. 8** Case 2: Balters' Bionator in place at beginning of treatment.

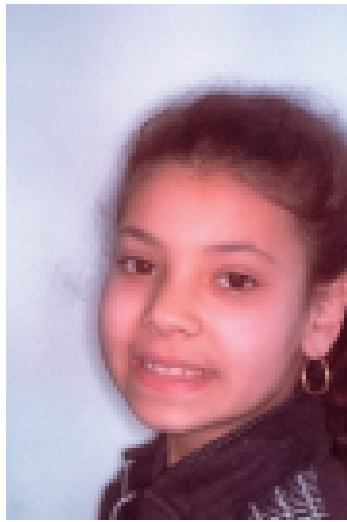


**Fig. 9** Case 2: clinical observation 90 days later.



**Fig. 10** Case 2: occlusal ramps used for to treat posterior crossbite on right side.

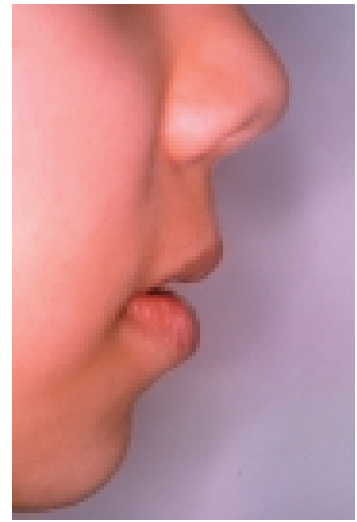




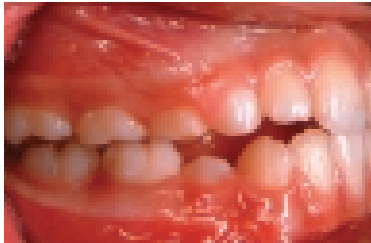
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(b)



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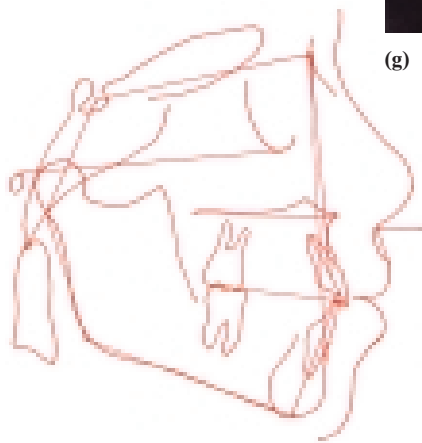
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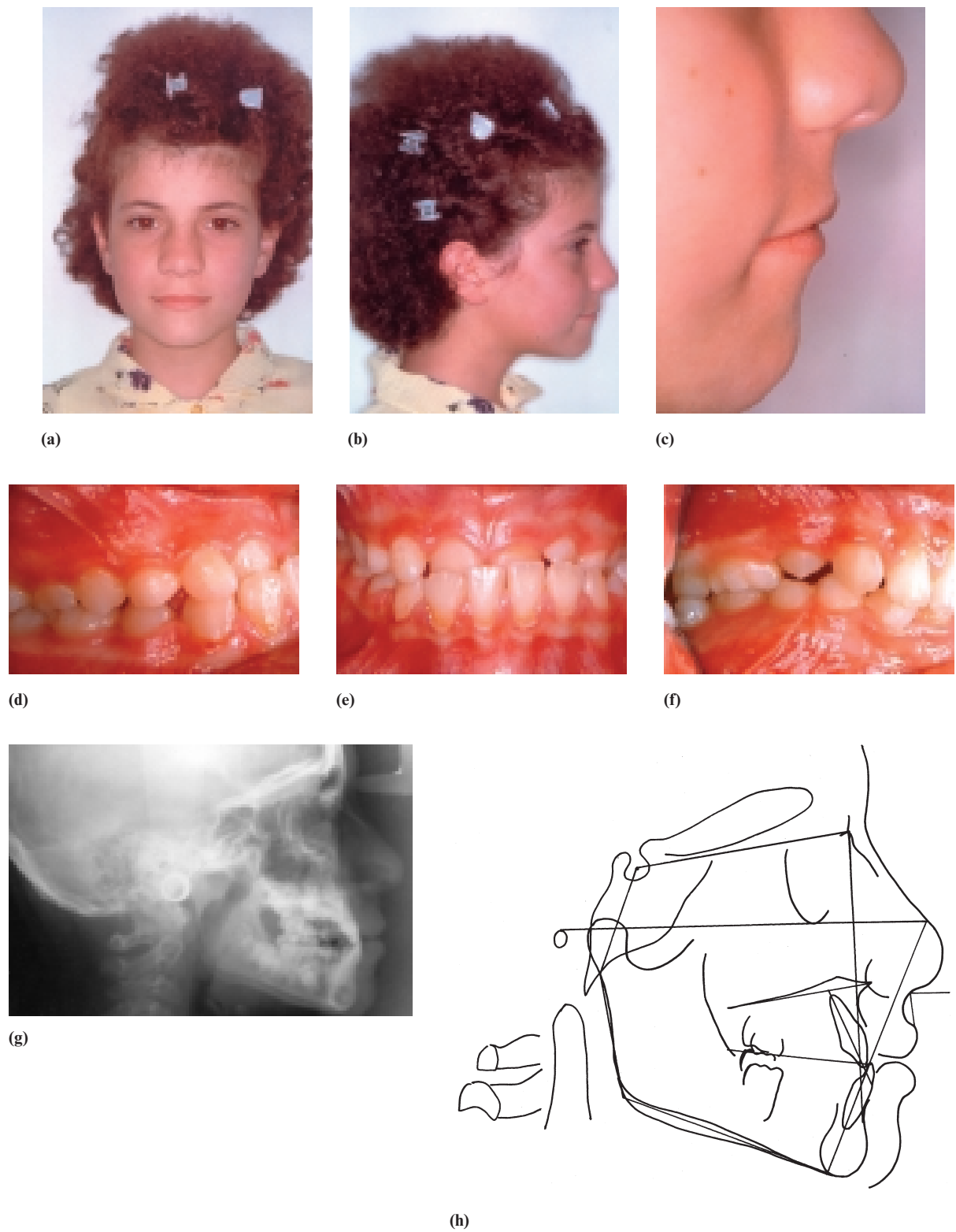


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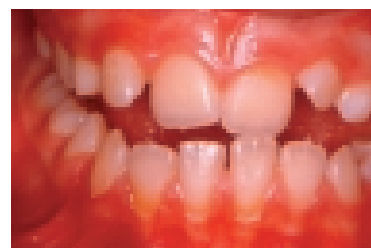
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**Fig. 11** Case 2: post-treatment records, cephalometric tracing and superimposition.



**Fig. 12** Case 3: pre-treatment records and cephalometric tracing.

improve and stabilize the results obtained. After 7 months a good occlusion with a Class I canine and molar relationship was obtained. The patient presented a normal overbite and overjet and the midlines were coincident (Figure 15). Final superimpositions showed improvements in the linear and angular dental values. The slight maxillary protrusion coupled with the clockwise mandibular rotation produced an overall improvement of the patient's aesthetic appearance. A slight downward and forward mandibular growth, has occurred which will continue to be regularly monitored (Table 3).



**Fig. 13** Case 3: intra-oral view before treatment; an early interference of first upper and lower left incisors in centric relationship is detected (black arrow).



**Fig. 14** Case 3: Balters' Bionator in place at beginning of treatment.

## Discussion

The various treatments suggested in the literature for the correction of anterior crossbite include several different appliances, both fixed and/or removable with heavy-intermittent forces (inclined bite-plane, tongue blade) or light-continuous forces (removable appliance with auxiliary springs).

Other alternative therapies that may correct skeletal problems in young patients have been shown to be effective, with significant changes in the cranio-facial complex, including the use of protraction headgear,<sup>15</sup> chin-cap,<sup>16</sup> and Frankel III.<sup>17,18</sup>

Turley presented the therapeutic results of orthopaedic treatment with palatal expansion and custom protraction headgear.<sup>19</sup> Patients of 6–9 years of age can be brought to a normal occlusion in less than a year and this therapeutic approach also suggests that with proper diagnosis early Class III treatment can produce good results. Tsai suggests the use of rapid palatal expansion and standard edgewise appliance to resolve an anterior crossbite in a 7-year-old boy.<sup>20</sup>

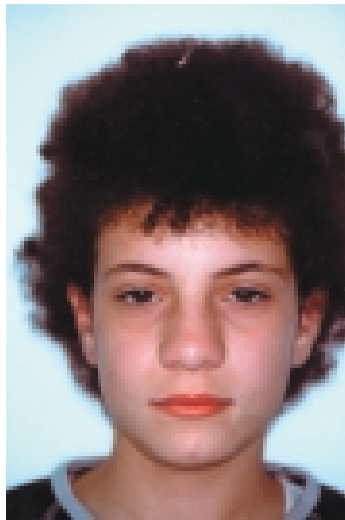
Rabie and Gu have described a simple method for the early treatment of pseudo-Class III malocclusion in the mixed dentition with fixed appliance.<sup>21</sup> Proclination of the upper incisors and/or retroclination of the lower

**Table 3** Case 3 cephalometric summary

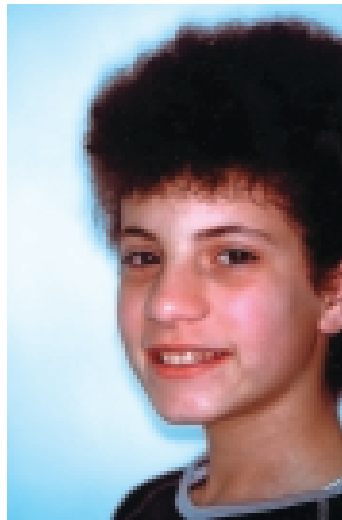
Measurement	Normal	Initial	Final
SNGOGN	32°	31°	30°
PocGoGn	16°	16°	16°
FMA	25°	22°	20°
SNA	82°	83°	82°
SNB	80°	84°	82°
ANB	2°	-1°	0
AoBo	0;3mm	-6mm	-4mm
I/NA	4mm	0	7mm
1/NA	22°	23°	30°
1/NB	4mm	3mm	3mm
1/NB	25°	26°	21°
FMIA	65°	68°	70°
IMPA	90°	90°	90°
I/I	131°	132°	132°
NLA	90°	84°	90°

incisors contribute to the correction of anterior crossbite and the elimination of mandibular displacement. The early treatment also permits us to gain space for canine eruption.

The therapeutic use of a Balters' Bionator appliance is



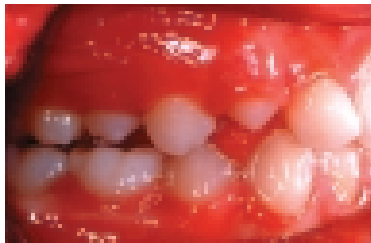
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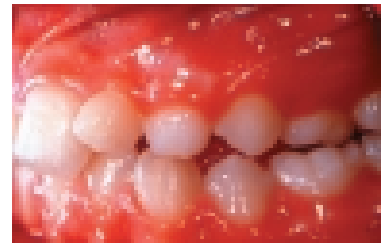
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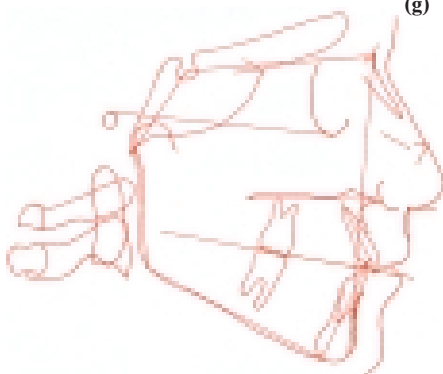
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**Fig. 15** Case 3: post-treatment records, cephalometric tracing and superimposition.

suggested in three case reports of subjects with anterior crossbite in mixed dentition. The patients all present with a convex soft-tissue profile. Pre-treatment cephalometric analysis showed an high mandibular plane angle in the first case, but the other two cases presented a normal growth with very little protrusion of the mandible.

Dental patterns revealed upper incisor retroclination and proclination of lower incisor in all cases.

The clinical examination revealed that the displacement was due to a premature contact between the upper and lower incisors.

## Conclusion

The patients all wore the Bionator approximately 15 hours daily for a period of 60–90 days.

At the end of this period in all cases the correction of anterior crossbite and the elimination of the mandibular displacement were obtained, but the use of a Class III Bionator was continued for a further to maximize chances of stability.

The literature demonstrates that functional appliances work in correction of anterior crossbite. The suggested advantages of this approach are as follows:

- prevents unfavourable growth especially mandibular protrusion;
- prevents habits such as bruxism;
- eliminates traumatic occlusion and anterior crossbite;
- eliminates the need for using bands and brackets, thus reducing the length of time that fixed appliances must be worn with all associated benefits, prevents functional posterior crossbite.

Principal disadvantages of Bionator treatment include the following:

- the final alignment of the teeth, is impossible without fixed appliance;
- cooperation from the patient is essential for the success of this approach.

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