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Class II malocclusion has high clinical prevalence, about 45%. It is accepted that Class II is acquired during the growth and development stages by general dysfunction of the neuromuscular dysfunction. There are several methods we can adopt. The treatment design and protocol must be used in the clinic by a therapy that really solves the problem. The treatment of each stage will produce: facial harmony, correct implantation of the teeth and function. Our long clinical activity gave us the right way to treat our more than 4000 patients.

The diagnosis carried out in three aspects:

1. Functional analyses
2. Orthopedic analyses
3. Orthodontic analyses

The diagnosis and the growth stages of the patient (Analyses of Cervical Vertebral Maturation – Baccetti and Franchi) are the most important aspects to be considered for the organization of an efficient treatment planning.

Another very important aspect is the evaluation of the maxillary transverse deficiency, which is the first part of the treatment planning, respecting orthopedic priorities.

In regard of orthopedic treatment plan, there are four important aspects to determine:

1. Class II with mandibular retrognathism
2. Class II with maxillary prognatism
3. Class II with fault in mandible and maxilla
4. Class II caused by orthodontic disharmonies

Subjects with mandibular retrognathism should be treated with functional orthopedic appliances that promote mandibular advancement such as Balters Bionator, Franckel Functional Regulator, Clark Twin Block, and Sanders Double Plate.

Subjects with maxillary prognatism should be treated with extraoral traction.

Subjects with fault in mandible and maxilla should be treated first with extraoral traction and completed with functional orthopedics.

In regard to the decision earlier or later treatment, it is definable that close to the pubertal peak, we expected that there is a significant increase of mandibular growth.

On the other hand, if the mandibular retrognathism is accentuated, it is necessary to treat the case immediately (mixed dentition) to achieve good orthopedic result.

The last part is the fixed orthodontic treatment resulting to the normal balanced occlusion.

Keep in mind: treat at the right place and right time!

Retain treatment for 6–12 months with orthopedic and orthodontic appliances is required.

A clinical observation should be executed until the second molars are erupted in normal occlusion.

For sure, our goal is the entire balanced stomatognathic neuromuscular system.

The purpose of this chapter is to reinforce the individualized diagnosis and the corresponding treatment protocol indicated for each individual patient as it is demonstrated by the examples presented.

*\* There is not a unique treatment protocol to be used for all Class II patients.*

The treatment of Class II Division I malocclusion is a multifactorial event whose factories should be analyzed by an individualized diagnostic protocol and the decision-making established. It has high clinical prevalence, about 40%. This anomaly is considered be acquired during the growth and development stages by general dysfunction of the neuromuscular epigenetic factors (Enlow 1968; Moyers 1988; Korkhaus 1930).

- The orthopedic diagnosis shows the prevalent of 80% of mandible retrognathism and 20% of maxillary prognatism. The treatment protocol for both categories must be totally different (McNamara 1984).

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First of all, we must have very clear the priorities of the neuro-functional, orthopedic, and orthodontic aspects that are individually determined by accurate diagnosis protocols (Ricketts 1960; Schwarz 1961; Björk 1955).

## 7.1 The Mandibular Retrognathism Treatment

The most important priority, as the first stage to be considered, is the maxillary transverse deficiency. It's absolutely necessary that the maxilla and upper dental arch be prepared to receive mandible in facial harmony, providing a normal Class I occlusion (Faltin et al. 2003).

The Balters Bionator is a totally functional appliance; there is no active component (Balters W).

It is composed by only three parts are (Fig. 7.1a, b):

1. The acrylic body (green color) which reproduced the new mandibular posture obtained at the construction bite. The amount of forward and vertical alteration might not be larger than 5 mm when necessary advancement must be realized step by step.

The body controls the vertical eruption of the teeth and the occlusal plane and supports the other two parts.

2. The lingual arch, made with 1.2 mm stainless steel a constant excitation for normal tongue posture. Never it is activated!

3. The vestibular arch, 0,9 mm with two functions: in the posterior part avoiding the interposition of soft tissues as buccinator complex (buccinator arch). The same arch in the frontal part, from canine to canine region, is adapted as a trainer for leap seal, again a functional trainer, labial arch. The new mandibular posture, the enhance in volume and in shape, the new lingual function, the normal functional behavior conduct to functional adaptation, and total correction of form and function were achieved (Fig. 7.1c-e).

The first example represents a case with a pronounced mandible retrognathic posture without dental arches discrepancies. The treatment protocol was Balters Bionator to normalize facial harmony in anterior and vertical directions (Balters W).

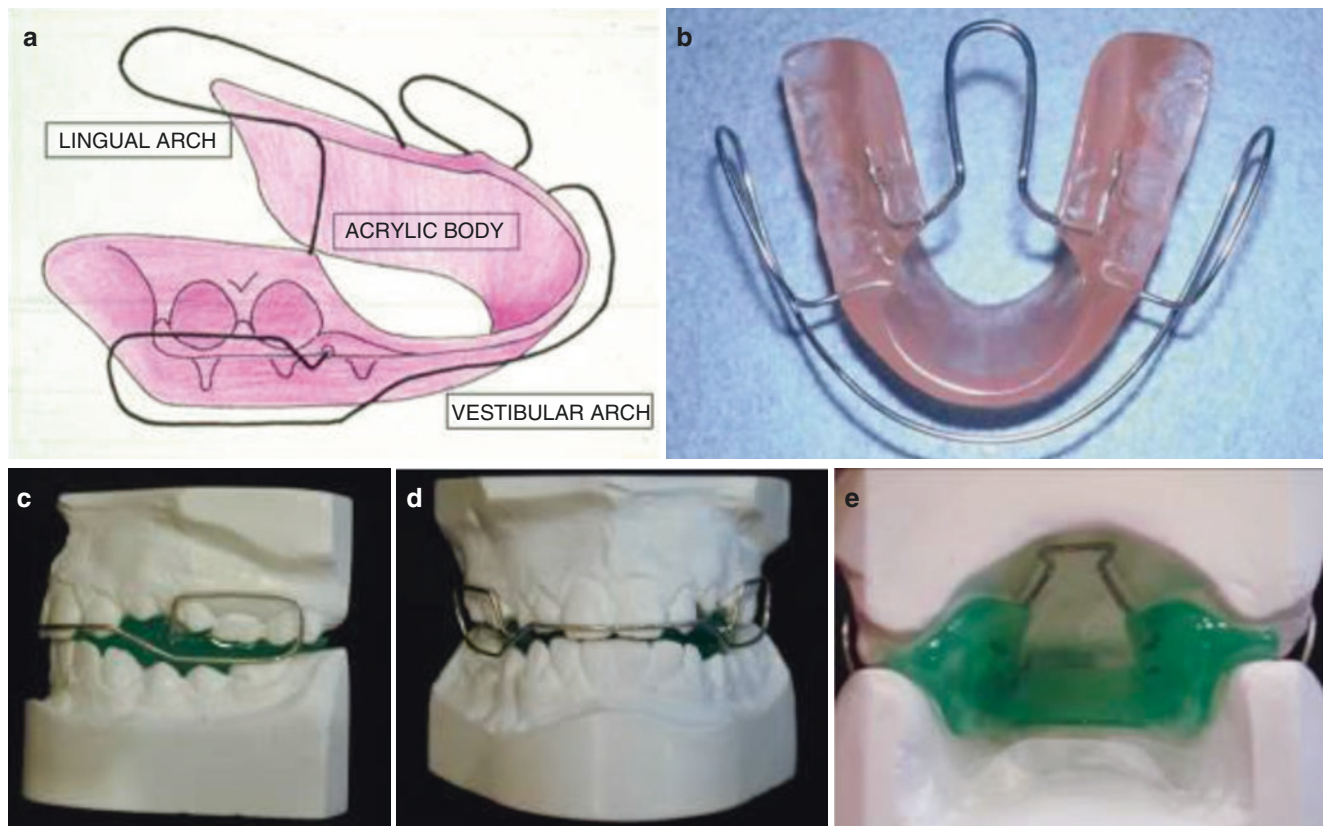
**Patient 1: M.S., 9y. 3 m.** At the beginning of treatment (Fig. 7.2a-e).

During 3y. 2 m. The patient used three Balters Bionators, with no use of any other fixed appliance.

In the follow-up, after finishing treatment, patient used the last Bionator full days during 6 months and nighttime for another 6 months. The results are observed at Fig. 7.3a-e).

Figure 7.4a, b illustrates a lateral cephalometric study before and after the treatment.

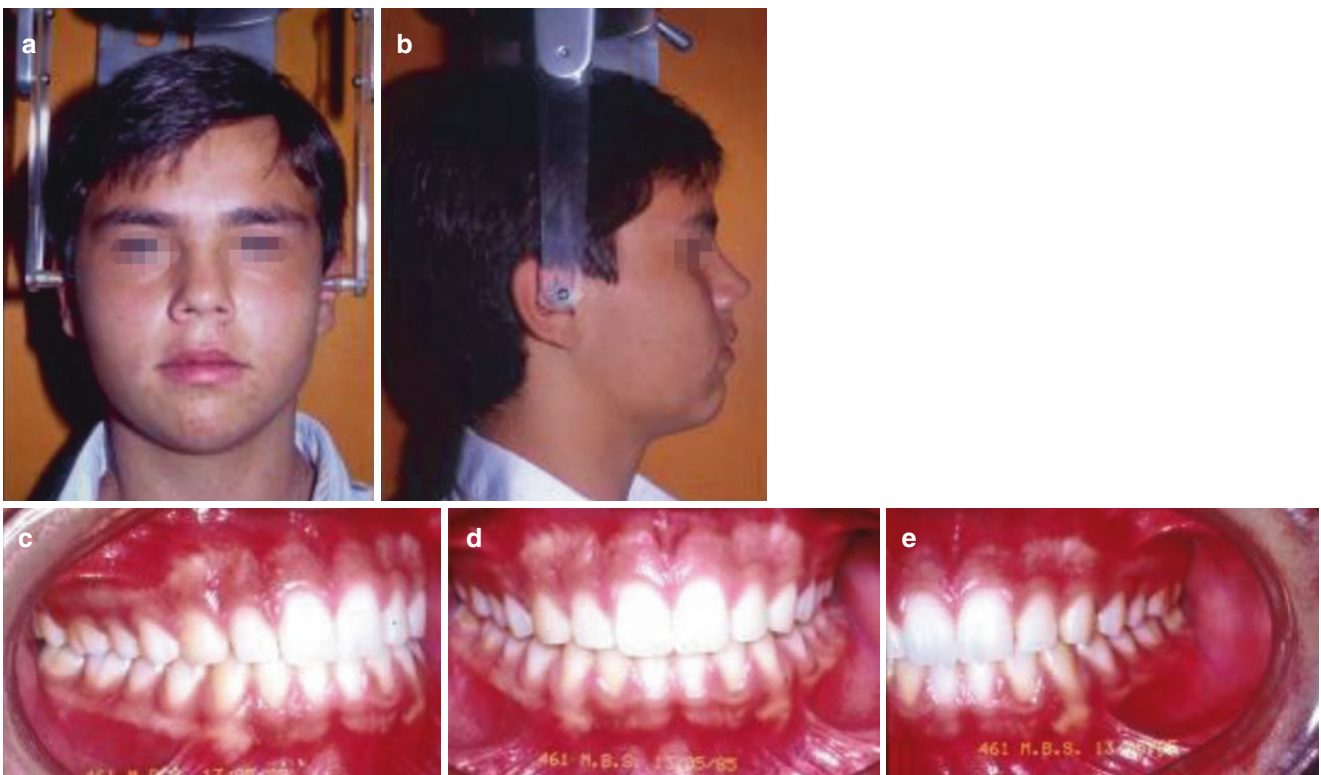
The long-term evaluation after 7 years (Fig. 7.5a-e) was performed and demonstrates the stability even a better situation after orthopedic mandible Class II treatment.



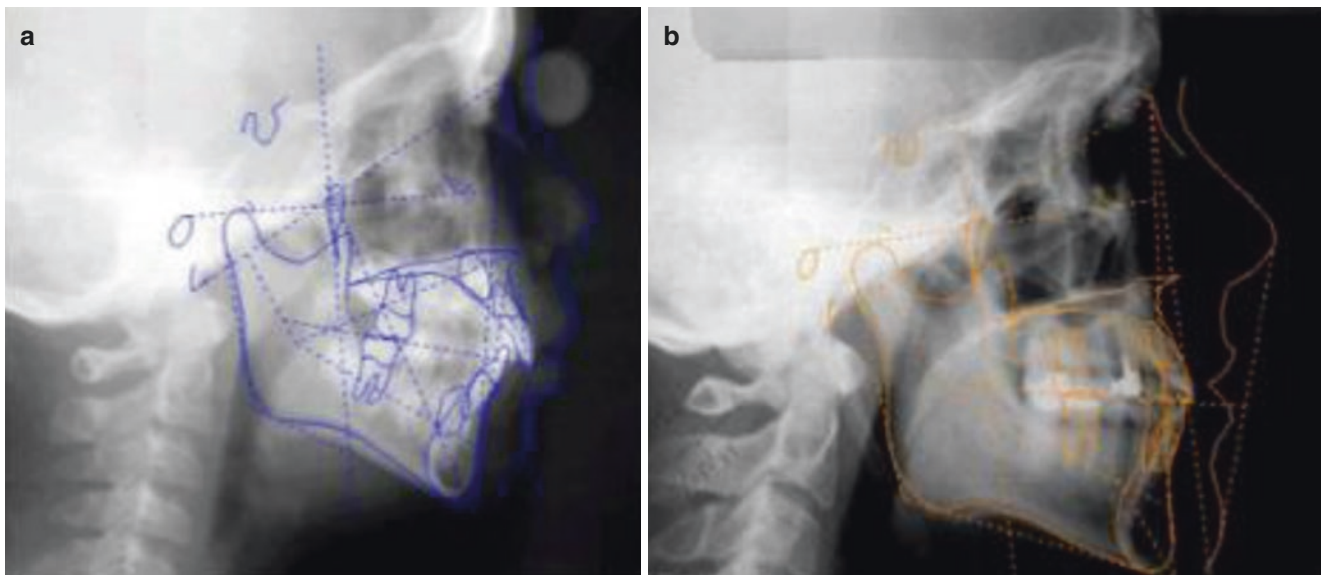
**Fig. 7.1** Balters Bionator appliance



**Fig.7.2** Pre treatment frontal and lateral photographs. A convex profile is clearly observed



**Fig.7.3** Post treatment frontal and lateral photographs. Overbite is totally corrected and midlines are coincident



**Fig. 7.4** Comparison pre and post treatment lateral cephalograms



**Fig. 7.5** 7 years follow up. The results are maintained

It is to be convinced that the functional orthopedic intervention normalizing development factors and correcting neurophysiologic impute, through the central neuron system, promotes a very balanced and stable development and excellent result (Petrovic and Stutzmann 1977).

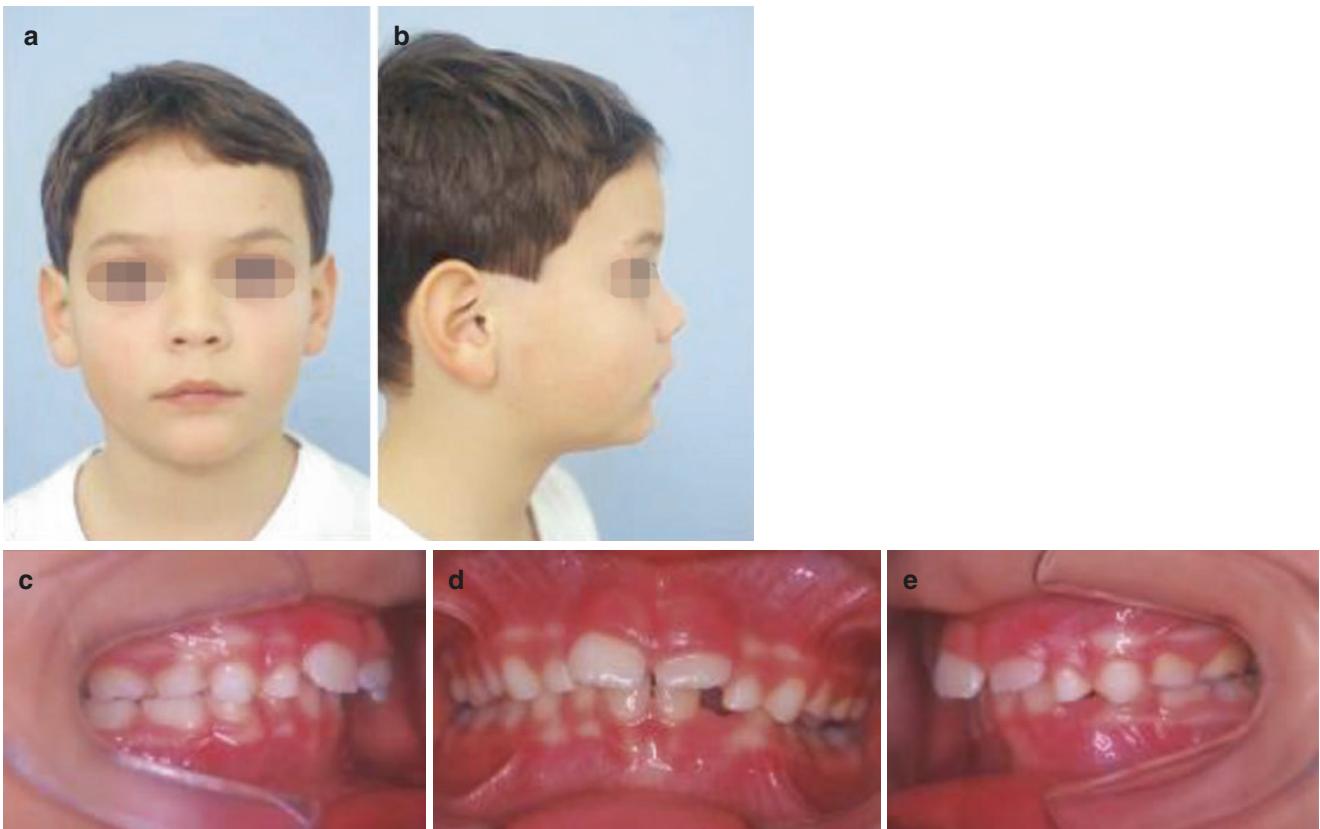
Frankel functional regulator – RF2 – is another orthopedic appliance that is used in the treatment of Class II Division I malocclusion with mandible retrognathism, in *growing* pre-pubertal period (Fig. 7.6a–c) (Frankel 1989, 2000).

Frankel appliances are located in the “vestibules orals” posturing the mandible, maintaining away the perioral capsule pressure and stimulating the whole respiratory system.

**Patient 2: P.H.L, 8y** At the beginning of treatment, (Fig. 7.7a–e) is similar compared with the first patient, but this case has some orthodontic problems: crowding, upper arch protruded teeth, narrow maxilla arch, deep vertical bite, and dysfunctions.



**Fig. 7.6** Frankel functional regulator (RF2)



**Fig. 7.7** Pre treatment frontal and dental facial and dental photos in a Class II 8 year old patient

The patient used three FR2 over 5 years of treatment, progress situation at 12y. 7 m (Fig. 7.8a–e).

Figure 7.9a–e shows the stability posttreatment over 2 years with no retention.

Figure 7.10a, b illustrates a lateral cephalometric study before and after the treatment and the excellent quality of mandibular development.

We must consider that only few patients are treated exclusively with Balters Bionator, Frankel functional regulator, or other functional therapies. Both therapies are similar and considered the only totally functional jaw orthopedic devices (Bishara and Ziara 1989).

The great majority of Class II Division 1 is patients with retrognathic mandible, transverse discrepancy of the maxilla, upper incisors protrusion, lower dental crowding, total Class II distal occlusion, and general dysfunctions. They need to be prepared before being submitted to a functional orthopedic treatment like the Bionator therapy.

R.M.E is the first recommended intervention. The Schwarz Plate or Ricketts lower utility arch may be indicated (McNamara 1985).

The next step of treatment will be the functional orthopedic stage with Balters Bionator, respecting all aspects from the construction bite to the adjustment in patient's mouth, instruction, and treatment control.

Unfortunately, a small percentage of cases can be treated only using Bionators.

After total analysis of the various, complementary examinees and appropriate analysis, the diagnosis will demonstrate upper transverse discrepancy in comparison with lower one, a deep bite, or an open bite, dental crowding, and respiratory dysfunction (Van der Linden 1986).

The patient must be prepared before being submitted to functional therapy like Balters Bionator.

**Patient 3: J.D.S., 9y. 3 m** At the beginning of treatment (Fig. 7.11).

Figure 7.12 shows the sequence before Balters Bionator used.

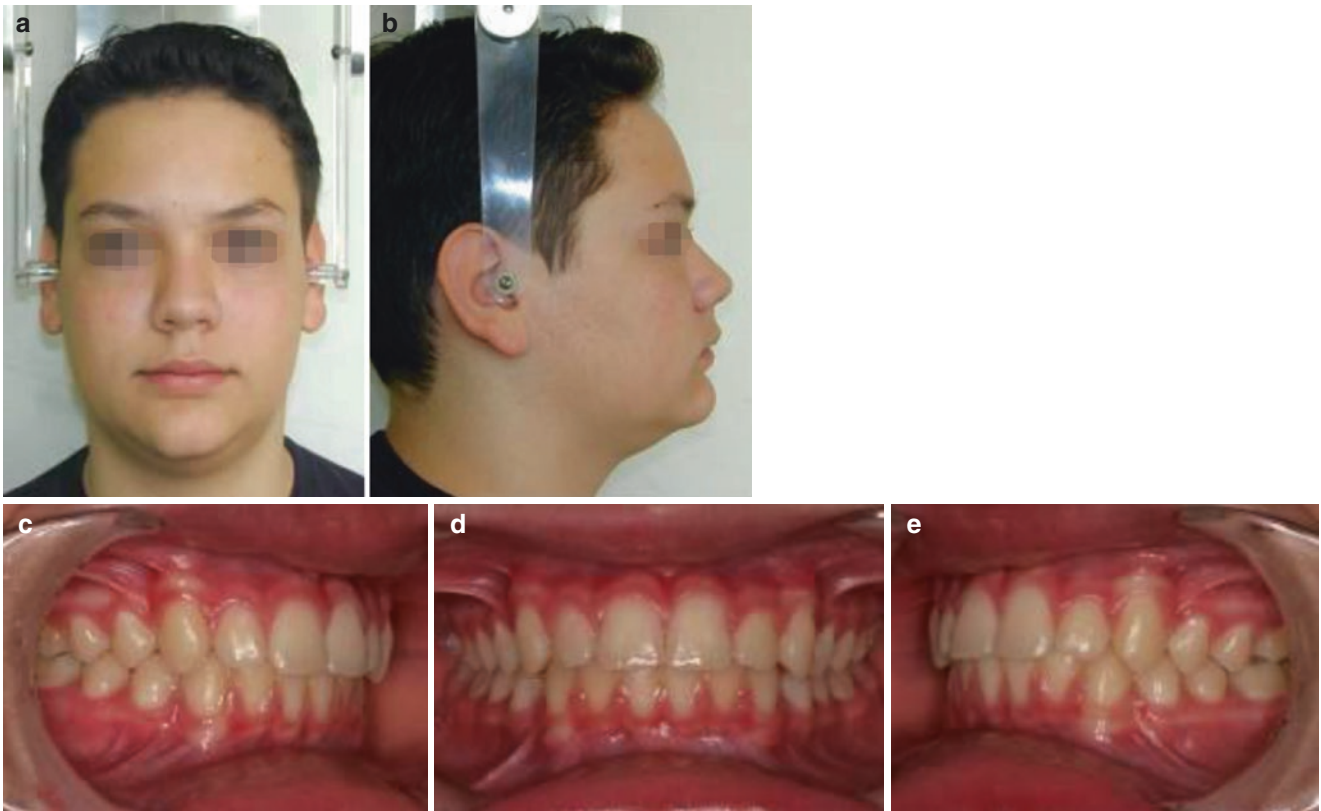
Sequence of the first stage: rapid maxillary expansion and simultaneously lower utility arc indicated to correct the lower incisors implantation. This phase took 8 months.

The second stage related with the facial harmony started immediately and was treated by an appropriated protocol in vertical, latero-lateral, and anterior-posterior directions. In this stage, the patient used a modified Balters Bionator.

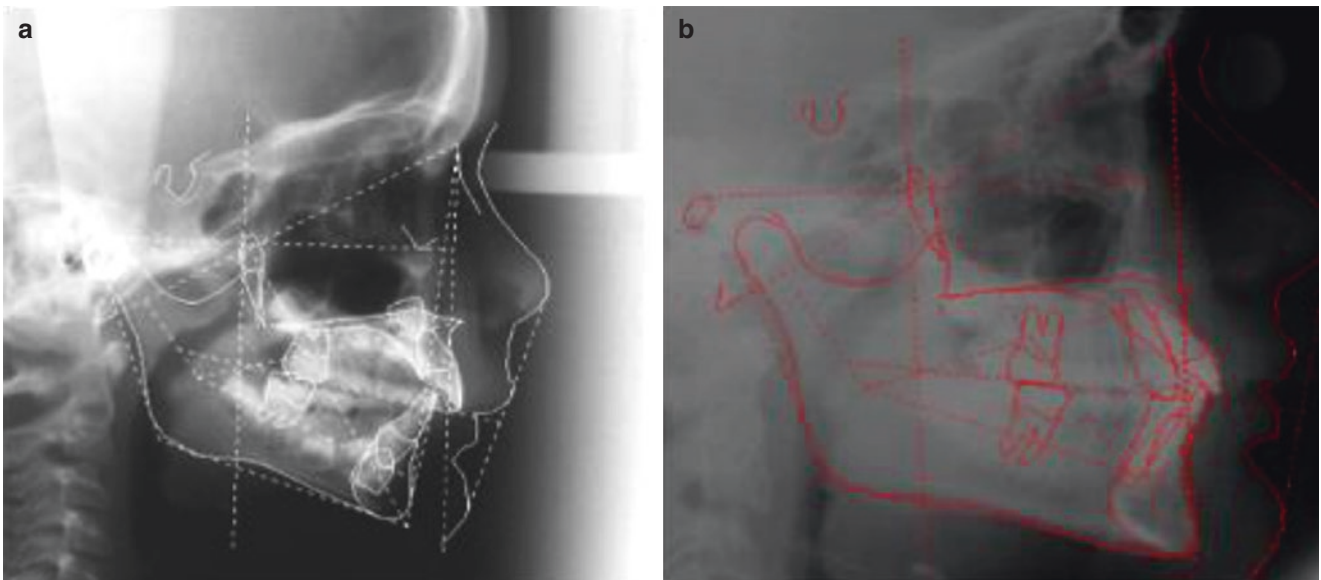
Balters Bionator was installed without removing the Lower Utility Arch in place. The use of Balters Bionator during 1 year and after the treatment was finished with fixed



**Fig. 7.8** Post treatment facial and dental photos : Class II is normalized as well as overjet and overbite



**Fig. 7.9** 2 years follow up with no retention



**Fig. 7.10** Pre and post lateral radiographs



**Fig. 7.11** Initial records



**Fig. 7.12** RME appliance in place



total appliance to correct teeth alignment and implantation and finally achieve functional normal occlusion.

The retention was upper plate and lower lingual fixed (Fig. 7.13 shows the final case and Fig. 7.14 shows the lateral cephalometric image). Excellent facial result. Facial dimensions are according to Fibonacci's divine proportion.

In cases like this, orthopedic and orthodontic treatment must be started very soon in order to be able to correct facial harmony, normal occlusion, and neuromuscular behavior.

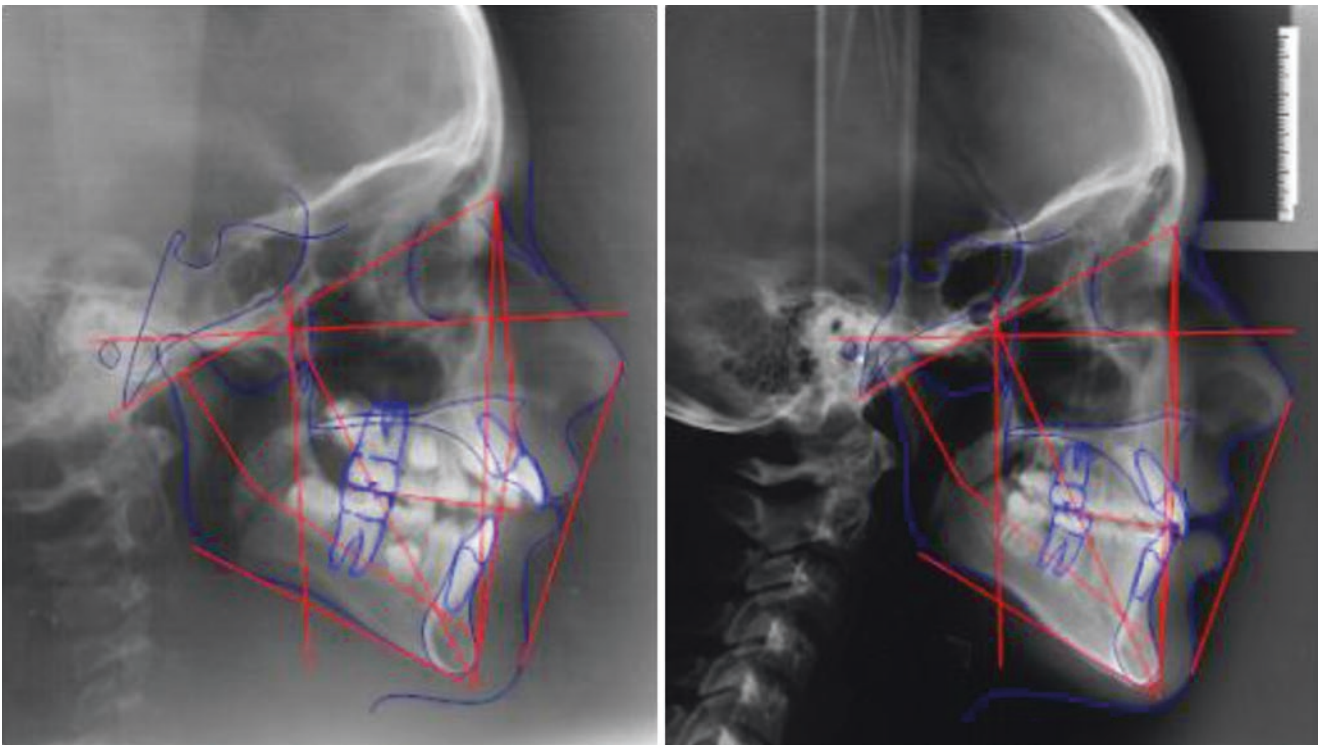
Sander, G., 1995, developed a new appliance – Bite Jumping Appliance – SII. It consists of two plates, remov-

able appliances with expansion screws and the upper one with a metallic guide that contacts the lower plate in the anterior region (Fig. 7.15a–c). Each time the patient closes the teeth, he or she advances the mandible and makes gymnastic with muscles induced by contacts on the front part as explained (Sander and Wichelhaus 1995) (Fig. 120).

At the same time, the SII appliance is a mandible protractor with transverse expansion of the maxilla and uprighting of molar posterior teeth. The advantage of SII treatment is the possibility to enlarge the maxilla, correct deep bite, open space for dental orthodontic treatment, and advance mandible at the same time. In these simultaneous cases, it is recommended to use



**Fig. 7.13** Front, profile and final dental results



**Fig. 7.14** Lateral cephalometric study before and 5 years after



**Fig. 7.15** Upper and lower SII appliance in place

Sander jumping the bite (SII). Sander's SII and Clark's Twin Block have a similar action.

**Patient 4: R.L.B.H., 12y** At the beginning of treatment (Fig. 7.16a–e). The first stage of treatment that lasted 1 year and 6 months shows the evolution and complete treatment with SII (Sander 2001) (Fig. 7.17).

Next stage with fixed appliance including retention took 15 months and present very stable results. Figure 7.18a–e presents the end of treatment.

The long-term evaluation confirms a very stable result (Fig. 7.19a–e).

Cases of patients with pronounced Class II Division 1 with severe retrognathic mandible, upper protrusion, deep bite, and dysfunctions but without lower crowding must be treated immediately, even in the deciduous dentition. The biological reason is that the development of the dental facial complex under such reverse epigenetic factors will get worse with time (Korhaus 1940) (Fig 7.20).



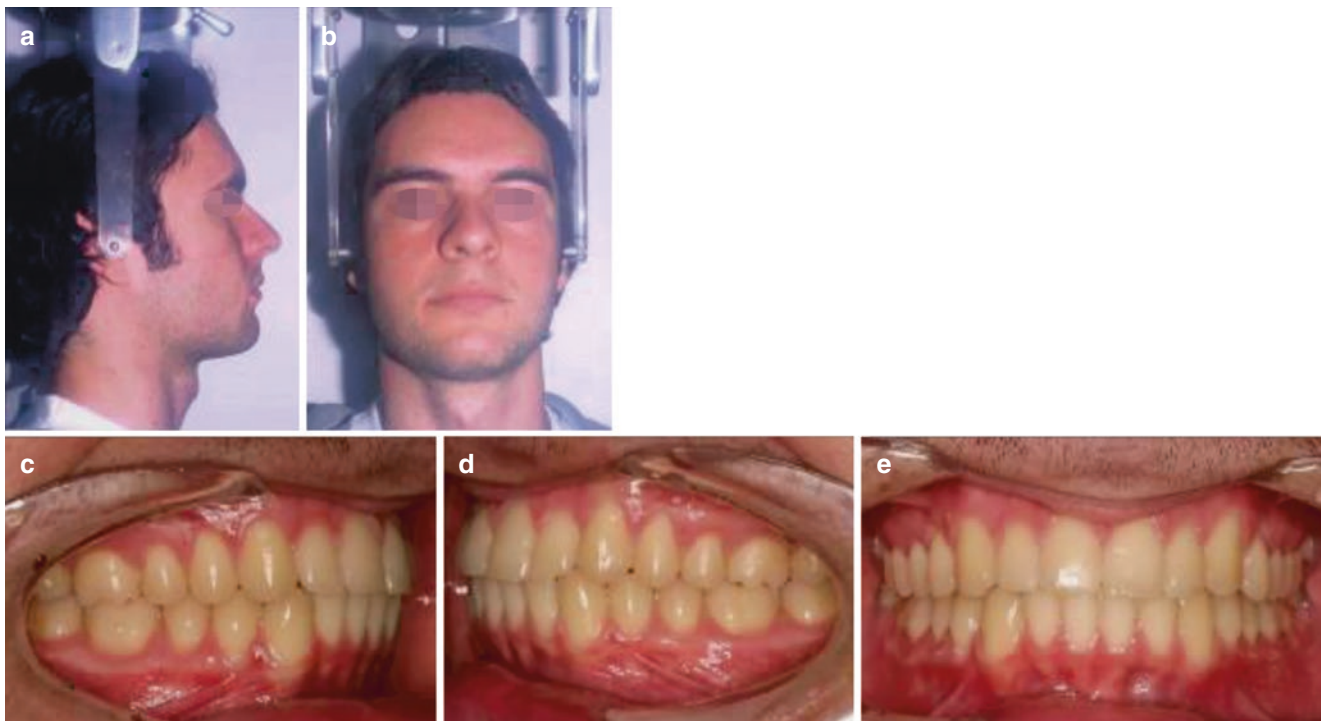
**Fig. 7.16** Pre treatment records of a 12 year patient with Class II molar and canine



**Fig. 7.17** SII appliance in place after 18 months of treatment



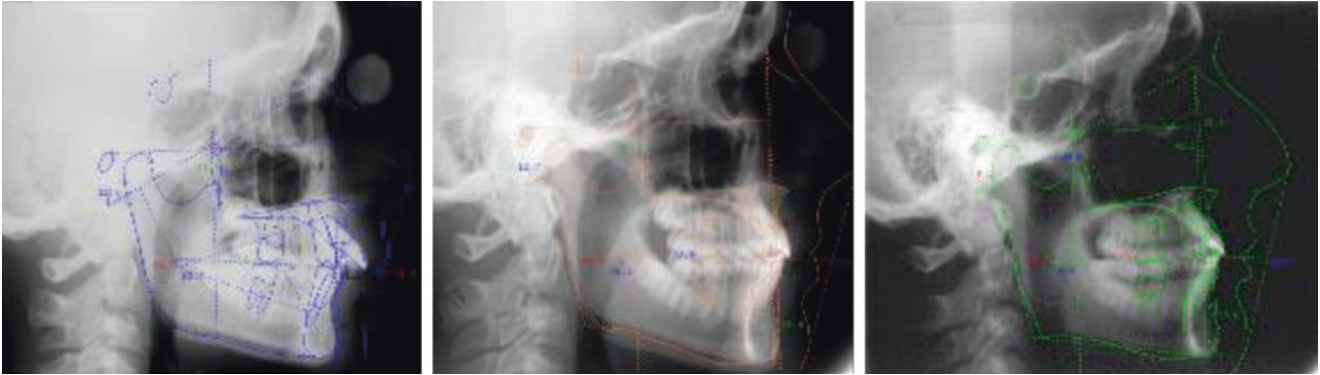
**Fig.7.18** Post treatment facial and dental photographs



**Fig.7.19** Final results

**Patient 5: L.M., 4y. 6 m** At the beginning of treatment. The treatment will take a long time using the Balters Bionator during the first stage and Sanders' double plates (SII) during second stage (Figs. 7.21, 7.22, 7.23, and 7.24).

All priorities could be normalized, facial orthopedic harmony, balanced occlusion, and balanced neuromuscular function. That is the real stimulation for normal functional adaptation including form, size, and shape of the masticator system (Faltin et al. 2003; Malta et al. 2010).



**Fig. 7.20** Lateral cephometric measurements: before, during and after treatment



**Fig. 7.21** Pre treatment photographs of a 4-year, 6-month old boy

The advanced of SII treatment is the possibility to wide maxilla, correct deep bite, open space for dental orthodontic treatment, and advance mandible.

The patient used upper expansion removable plate with super elastic screws, SII, and Bionator from November 2001 to March 2005 (Fig. 7.22).

From June 2010 to June 2013, the second stage was treated with fixed appliance and retention (Fig. 7.23). These excellent results could only be obtained when the treatment starts at a very young age.

The SII in treatment of Class II Division I with mandible retrognathism is indicated when the patient is in the prepu-



**Fig. 7.22** After using SII appliance and Bionator for Nov 2001 to March 2005



**Fig. 7.23** Final results

bertal stages of cervical vertebral maturation up to IV or V, as proposed by *Franchi e Baccetti*, with maxillary transverse deficiency and dental crowding.

In special situations of facial development, it is necessary to focus first on facial aesthetics.

**Patient 6: K.B., 10y** At the beginning of treatment (Fig. 7.25). The patient was treated in a unique stage. The priority was to achieve first the facial harmony because of the poor vertical dimensions. In sequence she was treated with bio-mechanics fixed therapy.



**Fig. 7.24** After long-term treatment



**Fig. 7.25** Pre treatment photos of a 10 year old Class II patient

### 7.1.1 The treatment sequence:

Balters Bionator result (Fig. 7.26) than fixed appliance and quadric helix (Fig. 7.27) and the end of treatment (Fig. 7.28). Figure 7.29 is lateral cephalometric study: before and immediately after and a long term (Balters 1964a,b).

In this case, because of the advanced stage of development, we decided to treat first the facial harmony with Balters Bionator philosophy than fix appliance according to Ricketts' philosophy.

**Patient 7: F.A., 10y.2 m** At the beginning of treatment. Another typical case of mandible retrognathism (Figs. 7.30a–c and 7.31a–c).

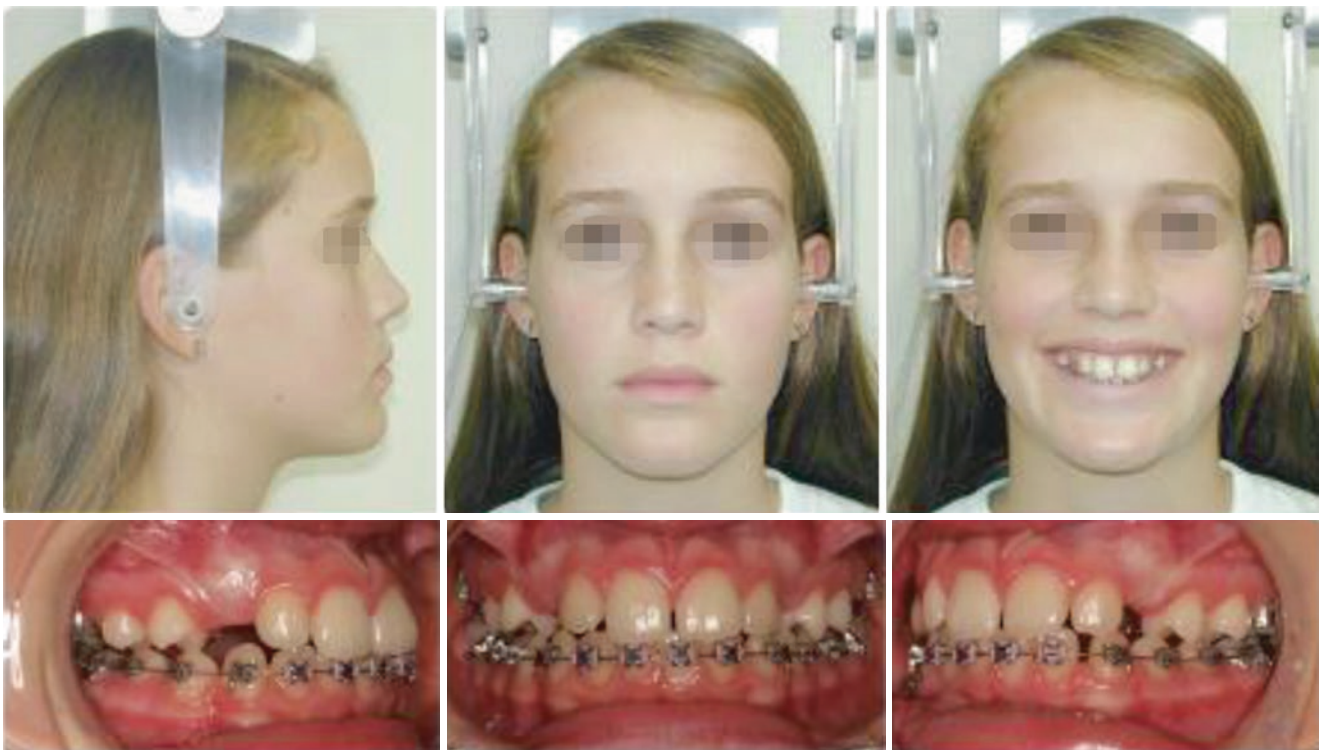
Figure 7.32 shows the occlusion with and without the Balters Bionator when the class I was achieved. The patient used five Balters Bionator during 2 years and 3 months and completed the treatment using fixed appliance.

Figure 7.33 presents the end of the treatment and the total treatment time was 4y. 3 m.

Figure 7.34 shows the stability of the treatment in long-term observation 6 years after retention.

Figure 7.35 shows the lateral Rx where it is possible to observe very clear the development of the face and recognize the mandible growth.

Figure 7.36a, b are images from CBCT, before and after the treatment, demonstrating the functional adaptation on TMJs, relocating the condyles in glenoid cavities.

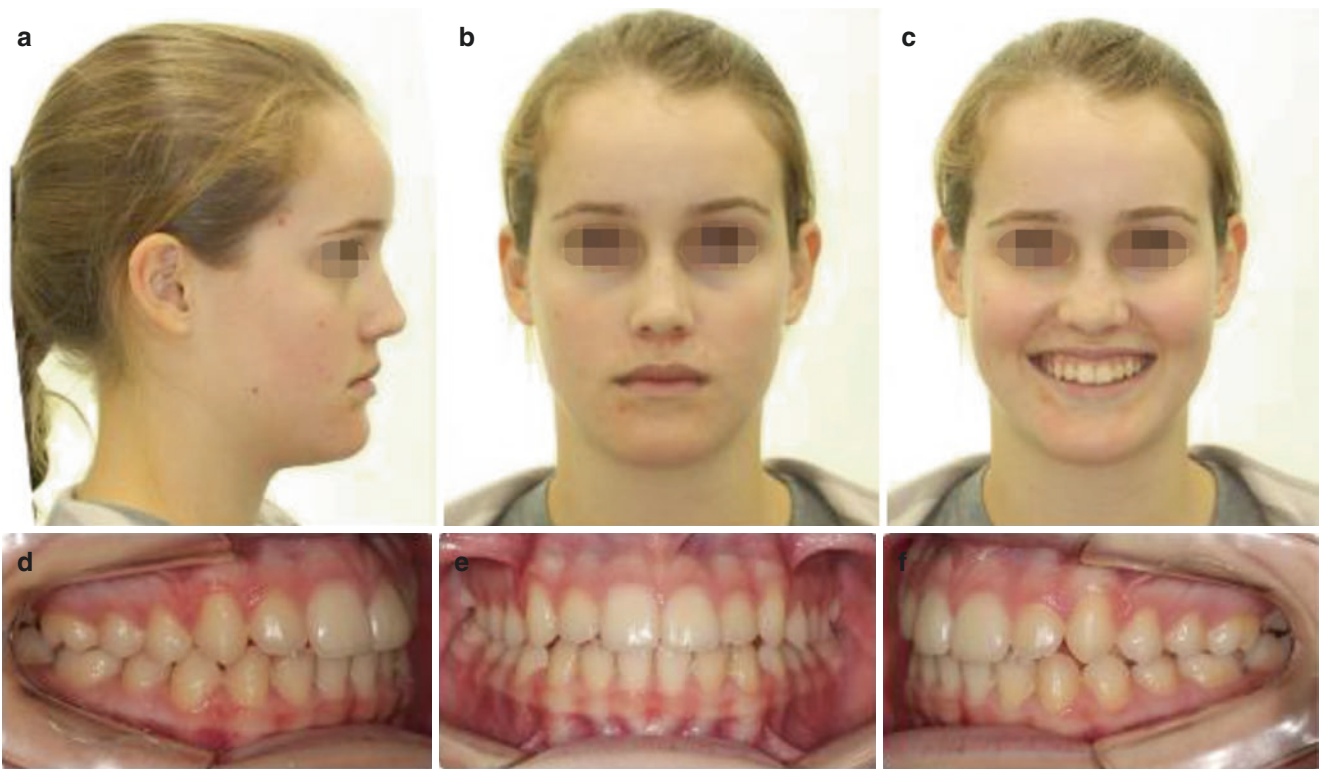


**Fig. 7.26** 1 yera in treatment with fixed appliances

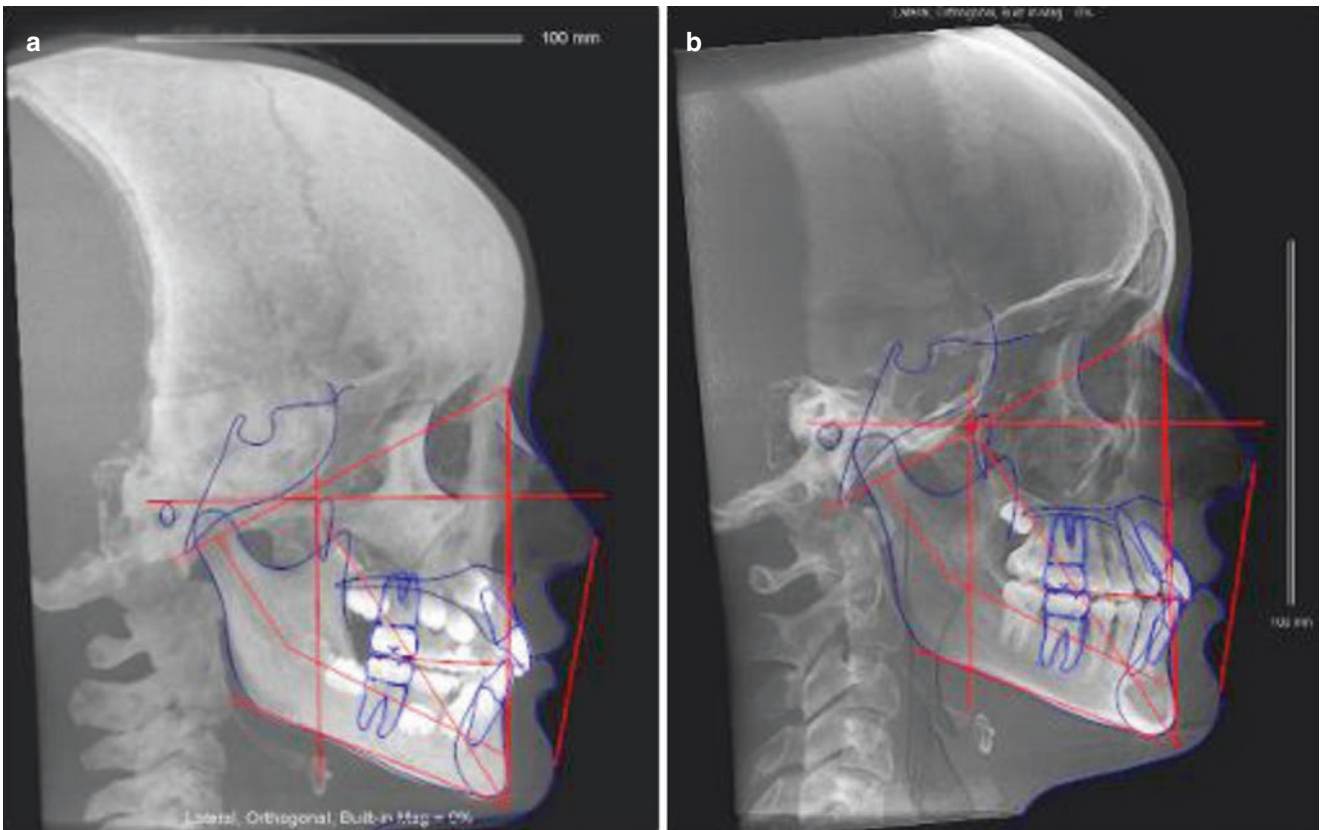




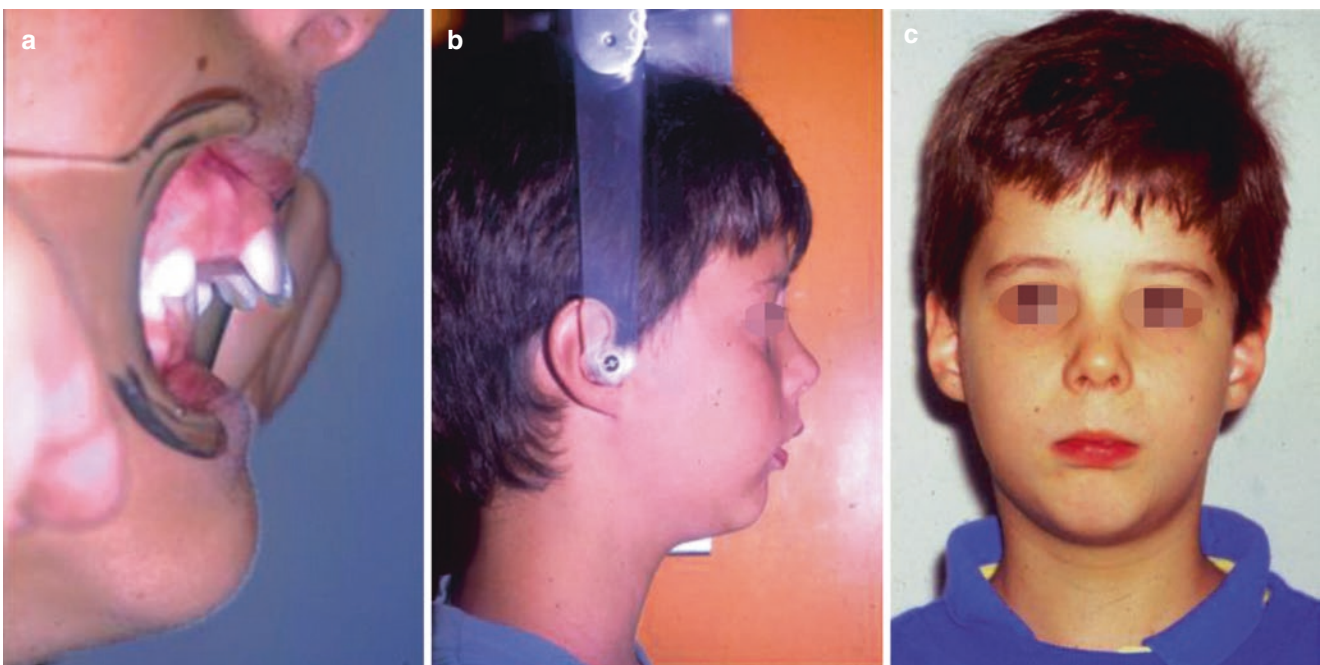
**Fig. 7.27** Dental upper and lower photos with brackets in place along with an upper quad-helix



**Fig. 7.28** Facial and dental post-treatment photos



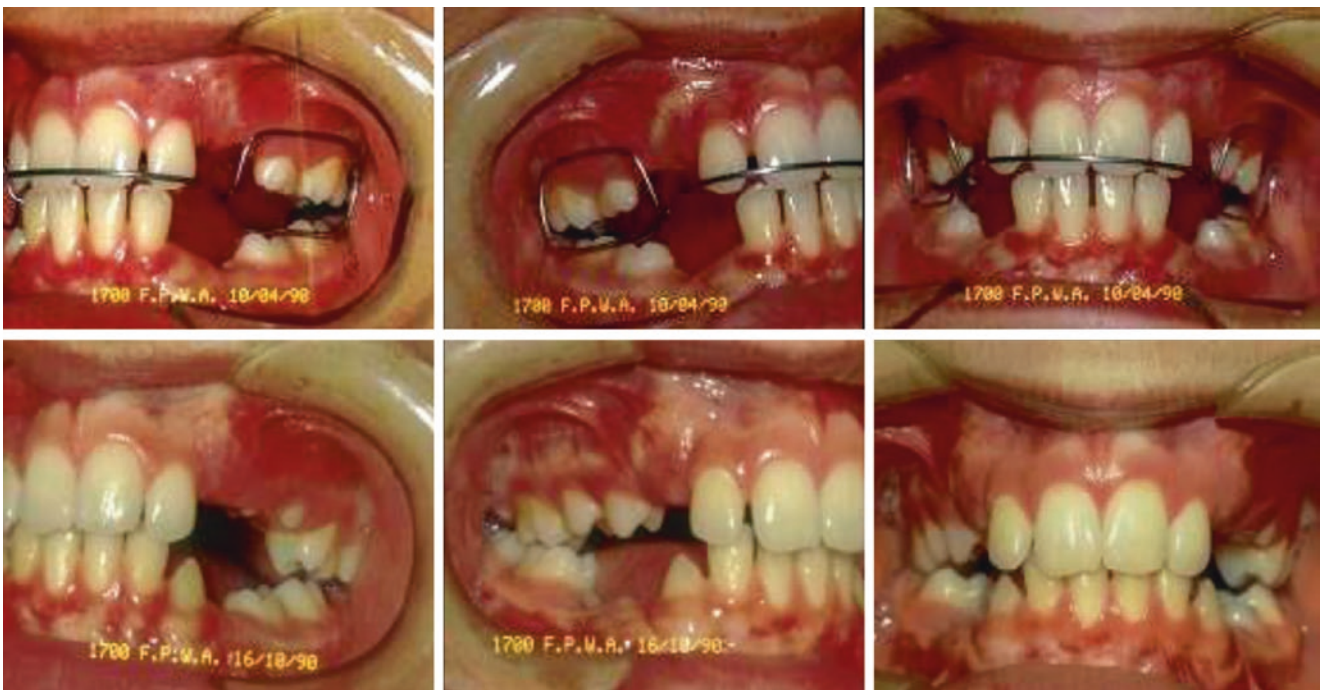
**Fig. 7.29** Comparison pre and post lateral radiographs



**Fig. 7.30** A 10 year 2 month boy with an important retrognathic mandible at the beginning of the treatment



**Fig.7.31** Pre treatment dental occlusion Midlines are not coincident and a significant overbite is present



**Fig.7.32** Occlusion with and without Balters Bionator appliance

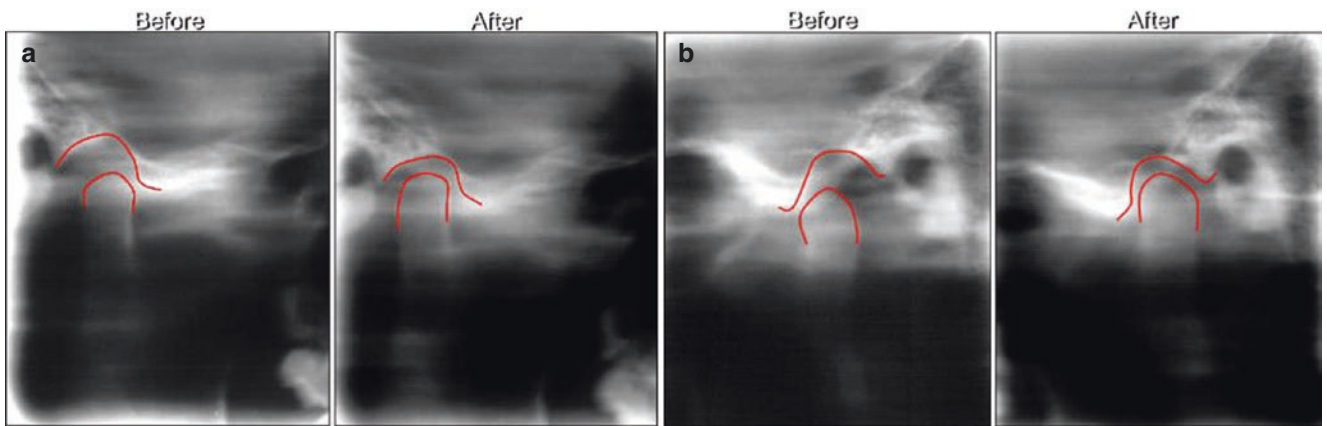


**Fig. 7.33** Facial and dental photographs at the end of the treatment



**Fig. 7.34** Follow up 6 years after the end of the treatment

**Fig. 7.35** Pre, Post and follow-up lateral radiographs



**Fig. 7.36** (a) Right condyle. (b) Left condyle

## 7.2 The Maxillary Prognathism Treatment

When Class II Division I is characterized as maxillary protrusion, the treatment protocol indicated is extraoral traction, developed by G. Sander (Fig. 7.37). This special extraoral traction appliance has constant cervical force of 4–5 newtons. The appliance needs to be used for 18 h per day.

When the individual diagnosis shows a narrow transverse midface and the RME is priority number one, start treatment with maxillary expansion is primordial.

The traction is always cervical. If the patient has a horizontal growth tendency, it is necessary to associate with an upper anterior bite plate. If the patient has a vertical growth tendency, it is indicated a lower posterior bite plate.

After the orthopedic correction, the treatment is finalized with biomechanics fixed appliances and finally retention.

**Patient 8: S.C.W., 11y** The beginning of treatment (Figs. 7.38a, b and 7.39a–c).

The first stage of treatment was maxillary expansion with upper removable expansion plate; treatment time is 8 m (Fig. 7.40).

The total treatment took 2 years and 11 months (Fig. 7.41).

Lateral cephalometric evaluation (Fig. 7.42) before, during, and long-term control shows total stable situation.

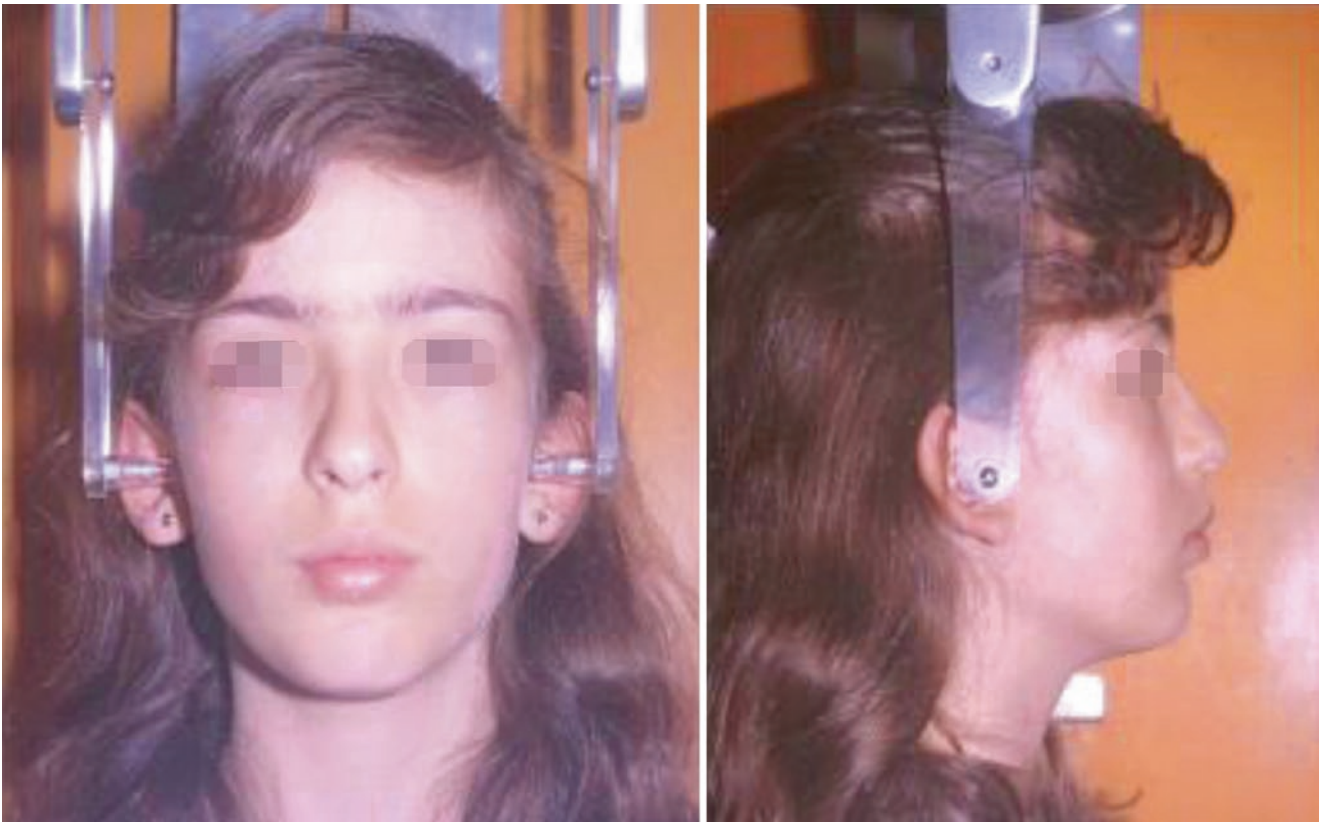
**Patient 9: C.P., 9y 10 m** The beginning of treatment (Fig. 7.43). This case illustrates a combined treatment of extraoral appliance and Balters Bionator.

The sequence was:

1. Maxilla transverse correction
2. Balters Bionator therapy during 2y and 10 m (Fig. 7.44).
3. Extraoral appliance (1 year) and another (13 months) total fixed appliance (Fig. 7.45) shows the case at the end of the treatment.
4. Long-term control (Fig. 7.46).
5. Lateral cephalometric images before and after the treatment (Fig. 7.47).



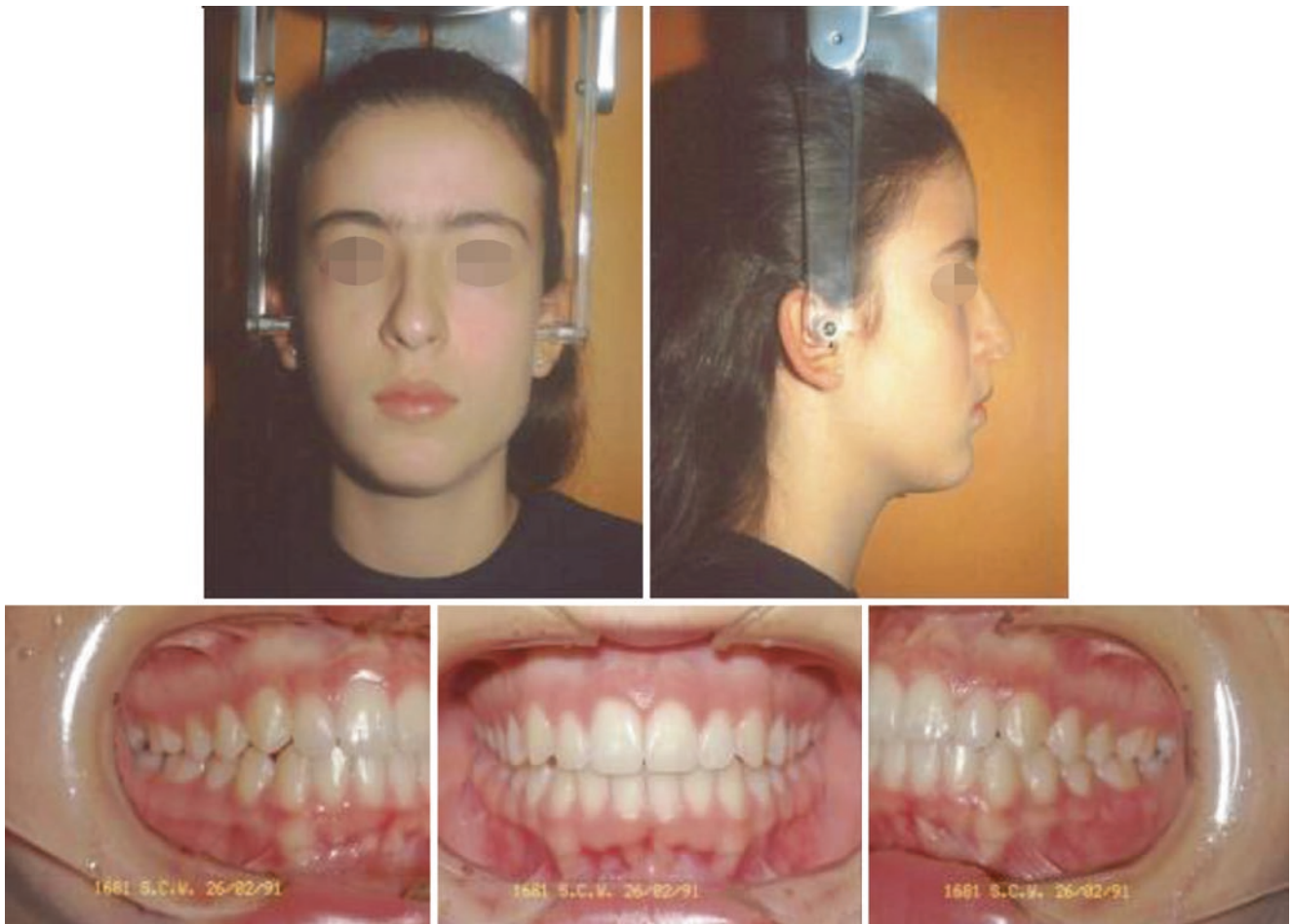
**Fig. 7.37** Lateral radiographs and Sander's extraoral traction appliance in place



**Fig. 7.38** Facial photos before treatment



**Fig. 7.39** Pre treatment frontal and lateral dental photographs along with an important overbite

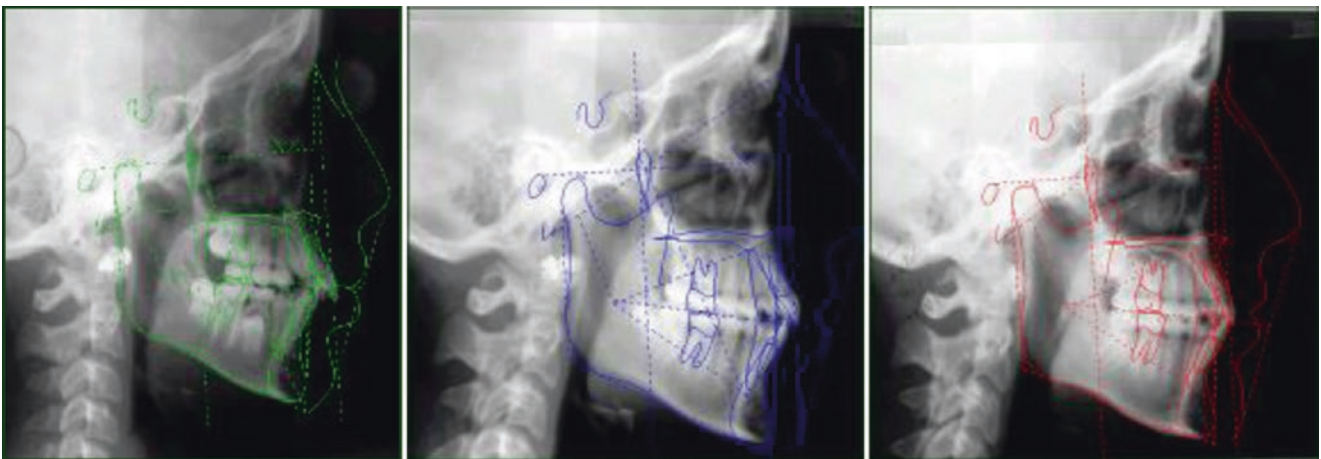


**Fig. 7.40** A significant improvement were observed after 8 months in treatment with an upper removable appliance





**Fig. 7.41** Final photographs after 2 years in treatment 11 months



**Fig. 7.42** Lateral cephalograms evaluation before, during and after treatment



**Fig. 7.43** A 10 year 10 months old patient



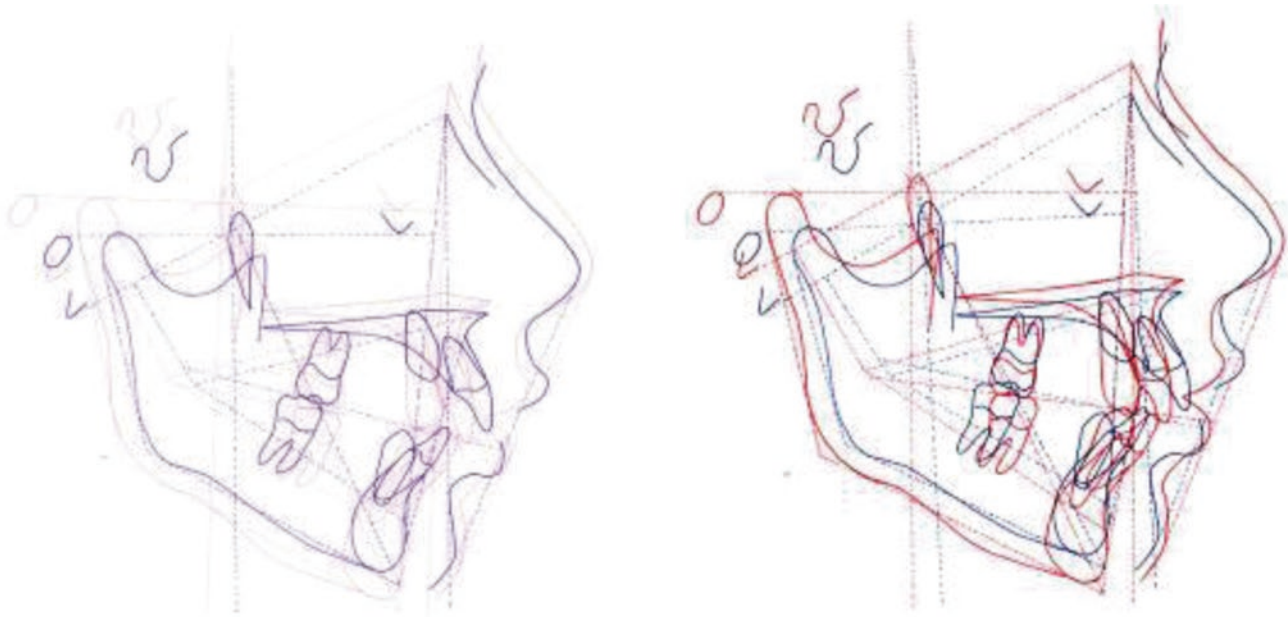
**Fig. 7.44** Results after a Balters Bionator therapy during 2 years



**Fig. 7.45** 1 year after Extraoral appliance and 13 months with fixed appliances



**Fig. 7.46** Long term follow up . The results were maintained



**Fig. 7.47** Final photos. Pre treatment cephalogram and superposition pre and post treatment

### Conclusion

According to the knowledge of the biological process involved in the dental masticatory system, the use of methods to individualize diagnosis and to create and correspond treatment planning, using the most efficient and appropriate therapeutic appliances, we certainly achieve facial harmony, normal occlusion, and neurophysiological that provides a homodynamic activity.

The future tendency of science philosophy of our professional activity encourages us to recognize that facial orthopedics is the first priority before orthodontics every time. The neuromuscular balance gives the long-term stability and the maintenance of the normal occlusion.

We must be prepared to understand the permanent evolution of our profession especially respecting the basic principles.

Our profession has the characteristic of permanent evolution. We are blessed with new basic, biological knowledge conducting us to be the first *facial orthopedist* than *orthodontists* guided by *physiological neuromuscular activities!*

### References

- Balters W. Die Technik und Übung der allgemeinen und speziellen Bionator- Therapie. Quintessenz 1964a; Heft 5.77,IV.
- Balters W. Extrait de technique du Bionator. Rev Franc Odontostomat. 1964b;11:191–212.
- Bishara SE, Ziara RR. Functional appliances: a review. Am J Orthod Dentofacial Orthop. 1989;95:250–8.
- Björk A. Cranial base development: a follow-up x-ray study of the individual variation in growth occurring between the ages of 12 and 20 years and its relation to brain case and face development. Am J Orthod Oral Surg. 1955;41:106–24.
- Björk A. Prediction of mandibular growth rotation. Am J Orthod Oral Surg. 1969;55:585–99.
- Enlow DH. The human face. New York: Hoeber Medical Div., Harper and Row; 1968.
- Fränkel R. Orofacial orthopedics with function regulator. Berlin: Karger GmbH; 1989.
- Fränkel R, Fränkel C. Clinical Implications of Roux's concept in orofacial orthopedics. J Orofac Orthop. 2001;1:1–21.
- Faltin Jr K, Faltin RM, Baccetti T, Franchi L, Ghiozzi B, Mc Namara Jr JA. Long-term effectiveness and treatment timing for bionator therapy. Angle Orthod. 2003;73:221–30.
- Korkhaus G. Antropologic and odontologic studies of twins. Am J Orthod Oral Surg. 1930;16:640–7.
- Korkhaus G, La Escuela Odontológica Alemana. Editorial Labor. Génesis de las anomalías de la oclusión y de las deformaciones de los maxilares 1940.
- Malta LA, Baccetti T, Franchi L, Faltin Jr K, Mcnamara JA. Long-term dentoskeletal effects and facial profile changes induced by Bionator therapy. Angle Orthod. 2010;80(1):10–7.
- Mc Namara Jr JA. A method of cephalometric evaluation. Am J Orthod Dentofacial Orthop. 1984;86:449–69.
- Mc Namara Jr JA, Brookstein FL, Shaughnessy TG. Skeletal and dental changes following function regulator therapy on Class II patients. Am J Orthod. 1985;88:91–110.
- Moyers RE. On the nature of orthodontics. Ann Arbor. Published by The University of Southern California School of Dentistry and Center for Human Growth and Development The University of Michigan; 1985.
- Moyers RE. Handbook of orthodontics. Chicago: Year Book Medical Publishers; 1988.
- Petrovic A, Stutzmann J. Further investigations of the functioning of the “comparator” of the servosystem (respective positions of the upper and lower dental arches) in the control of the condylar

- cartilage growth rate and of the lengthening of the mandible. The biology of occlusal development, Ann Arbor, 1977 Monograph No. 7: 255–91.
- Ricketts RM. The influence of orthodontic treatment on facial growth and development. *Angle Orthod.* 1960;30:103.
- Sander FG. Functional processes when wearing the SII appliance during the day. *J Orofac Orthop.* 2001;62(4):264–74.
- Sander FG, Wichelhaus A. Skeletal and dental changes during the use of the bite jumping plate. A cephalometric comparison with an untreated Class II group. *Fortschr Kieferorthop.* 1995;56:127–39.
- Schwarz AM. *Lehrgang der Gebissregelung.* Band I, 3 Aufl., Urban u. Schwarzenberg, Wien- Innsbruck, 1961.
- Van der Linden FPGM. *Facial growth and facial orthopedics.* Chicago: Quintessence, Inc.; 1986.