Pseudo-class III treatment with reverse traction: case report

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The pseudo-Class III can be defined as a functional reflex of an anterior positioning of the mandible, an acquired muscular position that simulates a mesiocclusion. The diagnosis and treatment plan of this condition must be based on a cephalometric evaluation that provides information about the relative contributions of the skeletal and dental components to the malocclusion. There is still great controversies about when is the best moment to start the Class III treatment. The purpose of this article is to describe a case report in which a Class III patient was successfully treated with reverse traction.
J Clin Pediatr Dent 25(4): 267-274, 2001

INTRODUCTION

The Class III malocclusion is a deviation that occurs mainly in Asiatic Countries and is a significant part of the orthodontic and orthopedic treatment in Korea and Japan. Nevertheless, it is present in just 5% of the North Americans[7] and, in Brazil, in 3% of the population of Bauru, São Paulo.[11] This malocclusion is characterized by a mandibular prognathism and/or maxilla deficiency, a molar Class III relation (mesiocclusion), and an anterior crossbite. It can be classified into skeletal, dental and functional.[8]

The skeletal Class III, a real osseous dysplasia, can be consequent to a mandibular protrusion, maxilla retrusion or a combination of the two situations.[9] Guyer et al.,[4] 1986 observed in a sample of 144 children aged between 5 and 15 years that the maxilla retrusion was present in 25% of the cases, while mandibular protrusion comprised 18.7%. On the other hand, the combination of these two occurred in 22.2% of the individuals.

The dental Class III presents a lingual tipping of one or more upper incisors, while in the skeletal Class III the upper incisors are generally labially tipped and the lower incisors present a lingual tipping. The pseudo-Class III is defined as a functional reflex of anterior positioning of the mandible, i.e. an acquired muscular position that simulates a mesiocclusion.[8]

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The diagnosis and treatment plan of the Class III patient must be based on a cephalometric evaluation that can provide important information about the relative contributions of the skeletal and dental components to the malocclusion. A facial analysis must also be performed, which takes the nose and upper face into account, which is combined to a profile evaluation, position of the chin and midface.[12] The patient must be evaluated in maximum habitual occlusion and in centric relation and the differential diagnosis is based on the molar and incisor relationship in these two positions. In skeletal Class III, the molars are invariably in a Class III relation and there is an anterior crossbite. In the functional Class III, when in centric relation, the molars are in Class I position and the incisors edge to edge.[8]

The proper time to treat a Class III has been subject of controversy. The possibility of eliminating the need of an orthognathic surgery is an advantage of early treatment, but there is sometimes the disadvantage of being a long treatment with unpredictable results concerning facial esthetics.[2,10]

Most of the minimum to mildly severe cases are successfully treated with reverse traction appliance, chin cup and functional regulator of Frankel (FR-3), when the etiologic factors have been eliminated. However, in some cases, after the growth period has ended, the results are compromised and the skeletal discrepancy has not yet been resolved.[6] Inadequate results can also be due to poor patient cooperation, since the orthopedic appliances used in Class III treatment are normally uncomfortable and unaesthetic.[12] Accordingly, the Class III treatment in many cases consists of dental compensations of skeletal disharmonies by means of proclining the upper incisors and retracting the lower anterior segment, as well as using Class III elastics associated to lower first premolars extraction.[12]

Some clinicians do not start the treatment until the end of the growth period, and it normally means a com-

bination between orthognathic surgery and orthodontic treatment. Although this treatment plan is generally efficient in correcting the skeletal and dental problems, the patients have to face some psychological problems during childhood.[6]

Consequently Class III treatment raises a clinical dilemma: is it better to start the treatment early or to wait until the end of the craniofacial growth period?[6]

Case Report

During the clinical examination, the Caucasian female patient was identified as 9 years old, with good oral health, an atresic upper arch and some loss of space for the permanent teeth. Her face was symmetrical with a straight profile and a mesofacial pattern (Figure 1 a, b). The intra-oral exam revealed a molar Class I relation, negative overjet and a functional anterior crossbite (Figure 2 a, b, c), confirmed by positioning the mandible in centric relation, when the incisors achieved an edge to edge relationship (Figure 2 d,e).

Panoramic radiograph showed the permanent teeth in normal stage of development and eruption according to Nolla's analysis (Figure 3 a). The cephalometric data of the lateral radiograph analysis are shown in Table 1.

The conclusions are that the maxilla and mandible were protruded in relation to the cranial base. The mandible was protruded in relation to the maxilla. There was a tendency of horizontal growth pattern. A straight profile was noted with well-positioned upper incisors and slightly proclined lower incisors. Finally there was a decreased maxillary length and increased mandibular length (Figure 3 b).

According to these data the diagnosis was a pseudo-Class III with functional anterior crossbite that presented a tendency for a posterior crossbite. The treatment plan was directed towards the correction of the anterior crossbite, expansion of the upper arch and control of the skeletal relationship.

Figures 1 a, b. Pretreatment facial photographs.

Table 1. Cephalometric analysis

Cephalometric data	Pretreatment	Post-treatment	5 years post-retention
SNA	85.8°	87.9°	90.4°
SNB	87.9°	85.4°	91.1°
ANB	- 2.1°	2.5°	- 0.7°
NS.GoMe	31.4°	32.4°	25.1°
Profile line	5.4 mm	4.5 mm	11.5 mm
1.NA	23.6°	24.3°	34.6°
1-NA	3.6 mm	3.4 mm	7.9 mm
1.NB	27.3°	21.2°	22.8°
1-NB	4.4 mm	3.6 mm	4.0 mm
CoA	80.1 mm	81.7 mm	85.5 mm
CoGn	109.9 mm	110.4 mm	120.3 mm
LAFH	59.9 mm	63.2 mm	67.2 mm
Facial Axis	95.6°	90.0°	93.4°
S-N	65.0 mm	63.9 mm	66.7 mm
S-Ba	32.7 mm	32.8 mm	36.8 mm

Figures 2 a, b, c. Pretreatment intraoral photographs.

Figures 2 d, e. Pretreatment intraoral photographs in centric relation position.

The treatment was conducted initially by the use of a removable upper appliance with an expansion screw and digital springs in the incisors to achieve the anterior crossbite correction as well as the incipient buccal crossbite correction (Figure 4).

After a month, there was improvement of the anterior crossbite from proclination of the upper incisors. (Figures 5 a ,b, c). The sequence of the planned treatment, a fixed edgewise appliance was prescribed for the upper arch (Figures 6 a, b, c) in association to a chin cup reverse traction. A 5/16 elastic with 16 ounces was applied to the upper molars in order to achieve a maxilla dento-alveolar protraction. The patient was instructed to use the appliance 14 hours per day and change the elastics once a week (Figures 6 d, e).

The treatment resulted in the Pseudo-Class III correction, upper arch expansion and leveling and alignment of the upper arch (Figures 7 a, b, c). The final lateral radiograph analysis (Figure 8a) presented the data shown in Table 1. Cranial base and partial superimposition of the initial and final tracings showed (Figure 8 b) that there was an enhancement in maxilla and mandible relation and also tipping of the upper and lower incisors. There was also a significant improvement in the profile (Figure 9). An upper removable appliance and a cuspid to cuspid lingual arch were used for retention.

Five years after the end of the treatment, during the clinical examination, the stability of the results could be observed (Figures 10 a, b). The cephalometric analysis (Figure 10 c, Table 1) and the superimposition of the tracings confirmed the stability and the maintenance of the results (Figure 10d).

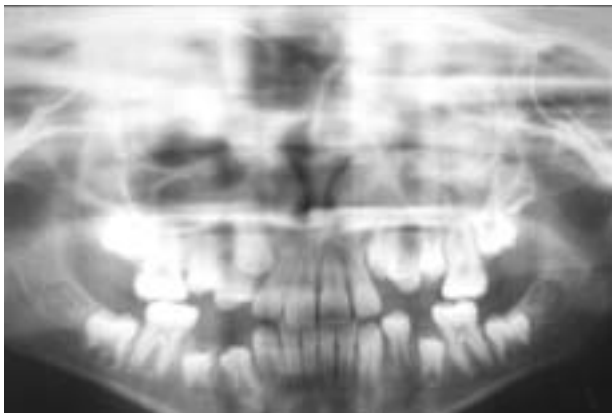


Figure 3 a. Pretreatment panoramic radiograph.

Figure 3 b. Pretreatment cephalometric radiograph.

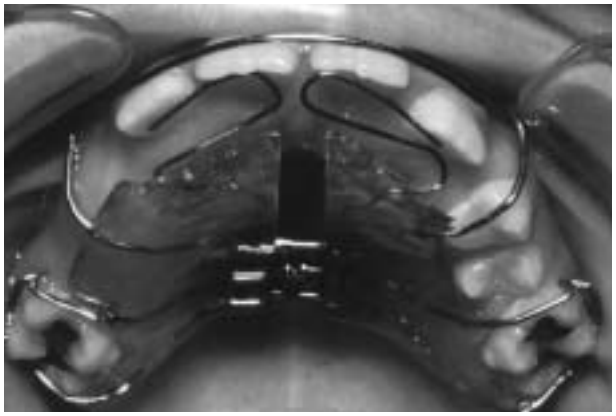
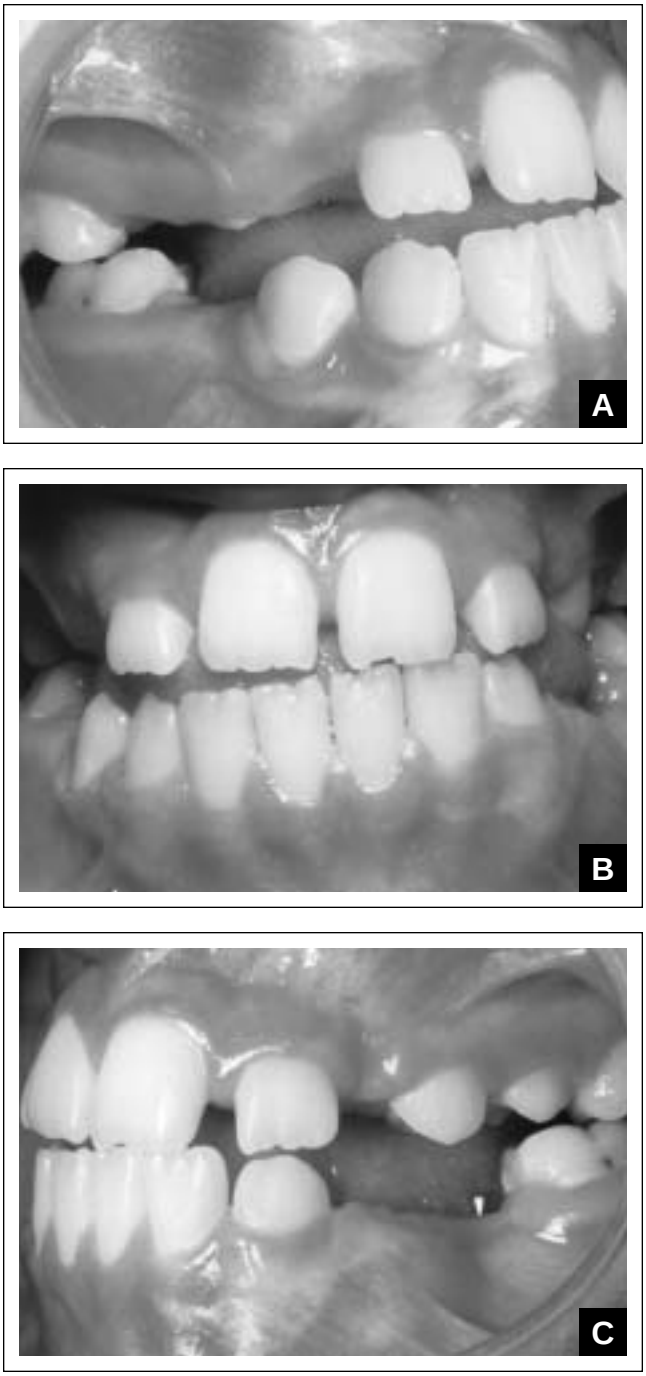


Figure 4. Removable appliance.

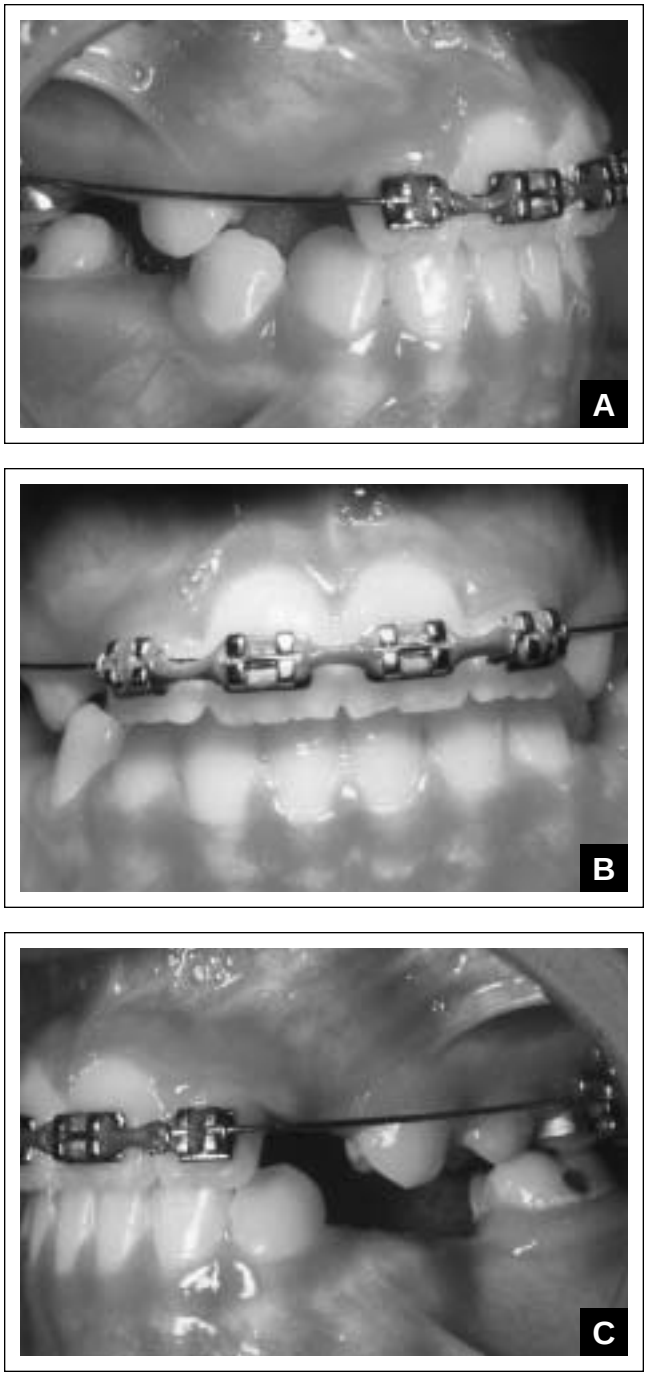


Figures 5 a, b, c. One-month removable appliance use intraoral photographs.

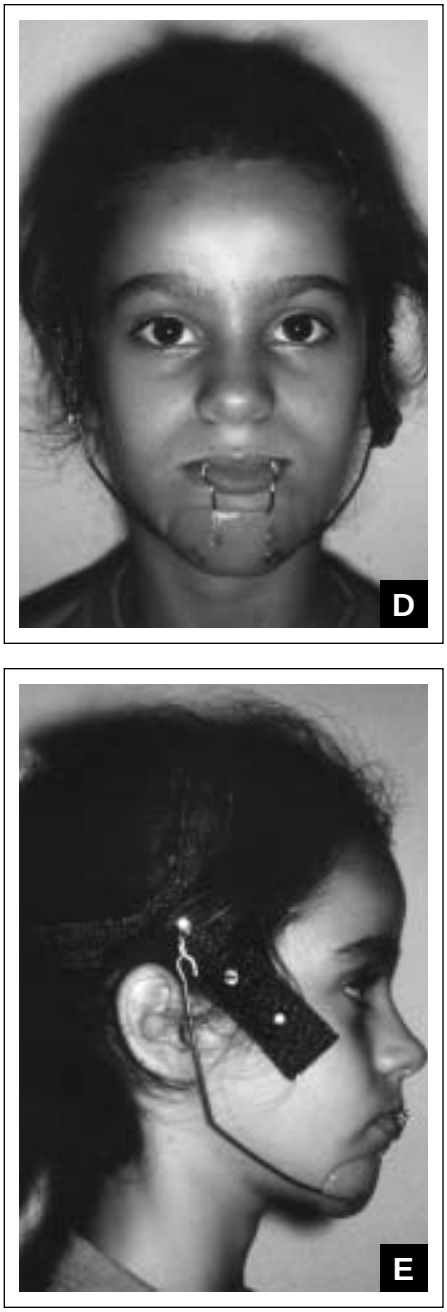
DISCUSSION

Class III patients exhibit dental and skeletal conditions early in growth and development stages of the craniofacial skeleton that tend to become worse with aging.[4,10,11] A large spectrum of abnormalities can be responsible for this malocclusion. For a long time, the mandible was considered the structure responsible for the establishment of a Class III malocclusion and the role of the maxillary complex was ignored.[9] But nowadays, it is known that the maxilla is retruded in 25% of the cases.[4]

In the described case high SNA and SNB angles were present and this can be explained by a decreased anterior cranial base length. This finding is in agreement with Guyer *et al*.[4] who reported a tendency for



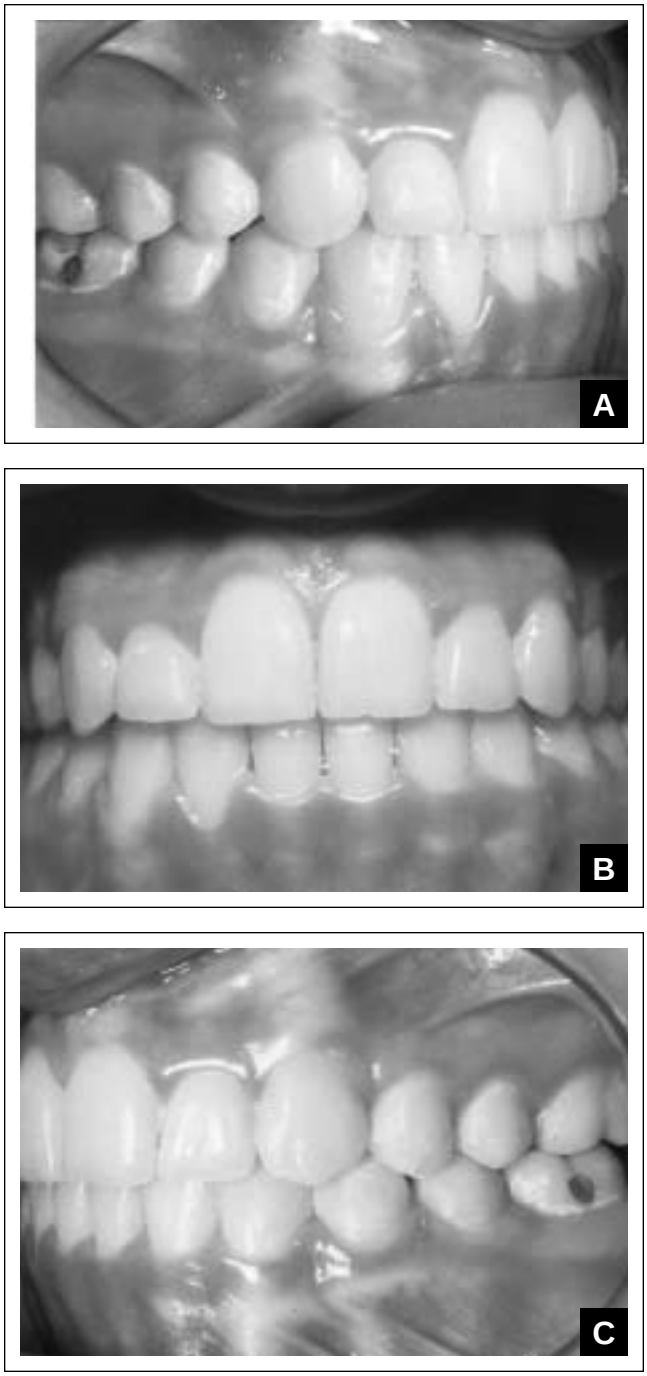
Figures 6 a, b, c. Intraoral photographs of fixed appliance in the upper arch.



Figures 6 d, e. Facial photographs showing chin cup and reverse traction appliance.

anterior cranial base alterations in Class III patients when compared to Class I. There are differential characteristics between skeletal Class III and Class I individuals, as for example: an increased posterior cranial base length (S-Ba), decreased maxillary length (CoA), an increased mandibular length (GoGn), an obtuse gonial angle and an increased mandibular plane.[4] Our patient presented an increased maxillary and mandibular length, which indicated a tendency to a skeletal Class III that could be worsened if not treated early.

The great majority of orthodontists are aware of the difficulties associated to Class III treatment even when identified in the end of the deciduous dentition and initial phase of the transitory dentition,[6] which is responsible for many controversies about when is the best moment to start the Class III treatment.[11] The probable need of surgical treatment in Class III patients worry the



Figures7 a, b, c. Post-treatment intraoral photographs.

Figure 8 a. Post-treatment cephalometric radiograph.

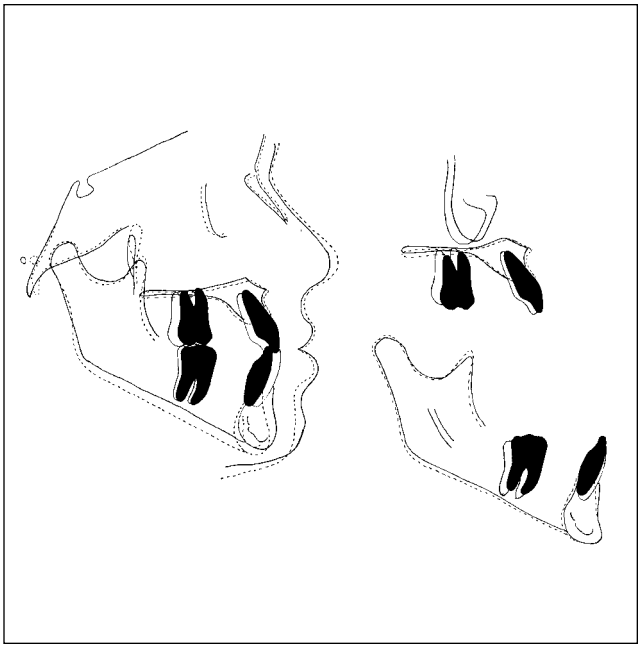


Figure 8 b. Cranial base, mandibular and maxillary superimpositions of the initial and final tracings.

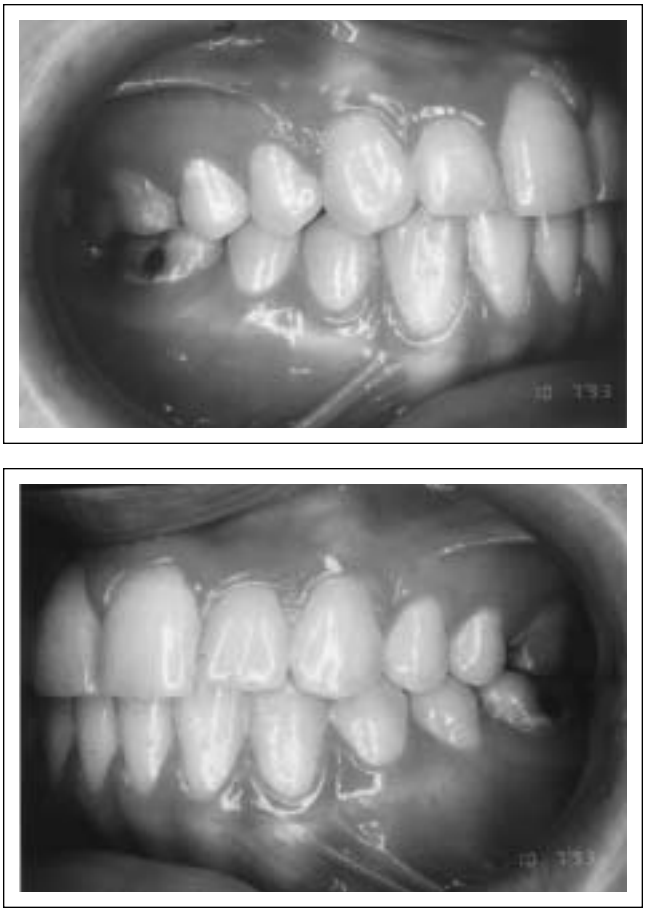
parents so that depending on the severity of the discrepancy early orthopedic procedure may be indicated.[10]

Many orthodontists decide to treat early using a chin cup, reverse traction or functional regulator of Frankel (FR-3).[1,3,6] The orthopedic chin cup is indicated in cases of excessive mandibular growth and may be used either with an occipital traction when there is a mandibular prognathism, or with a vertical traction in patients with high mandibular plane angles and excessive decrease in anterior facial high.[7] Functional regulator of Frankel is efficiently used in the transitory dentition and aims at the restriction of soft tissue forces associated with the maxilla complex. These forces are transferred to the mandible producing an effect of relative forward movement of the maxilla and its teeth as well as downward and backward alteration of mandibular growth.[7]

The reverse traction appliance is an extra-oral protraction appliance that has a chin cup and a head support. The force is applied in the anterior direction and is delivered by elastics attached to some point on the

Figure 9. Post-treatment profile photograph.

maxillary dentition and to wires put on the chin cups.[9] There may be different intra-oral maxilla protraction sites, in the first molar or premolar: when the force is applied in the molar area, the maxilla is anteriorly moved and there is forward and upward rotation (counterclockwise rotation), while when it is applied in the premolars region, the maxilla rotation is mainly downward (clockwise rotation). So the site of protraction must be selected considering the vertical dimensions of skeletal and dental structures and the amount of forward movement of the maxilla required. When there is a tendency to openbite, it invariably must be attached to the premolars region.[5]



Figures10 a, b. Five years after treatment, intraoral photographs.

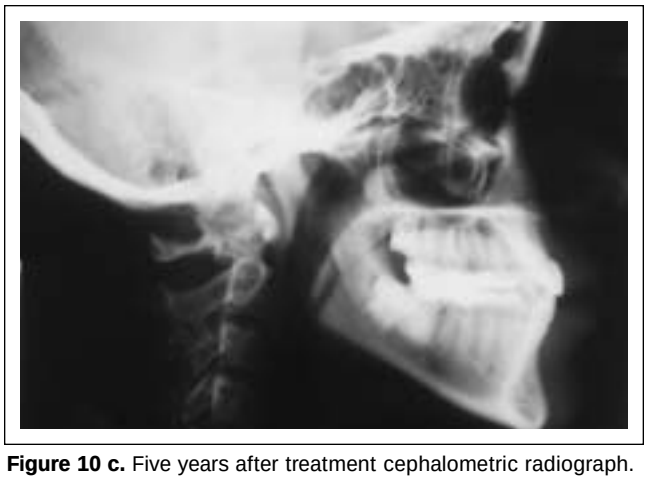


Figure 10 c. Five years after treatment cephalometric radiograph.

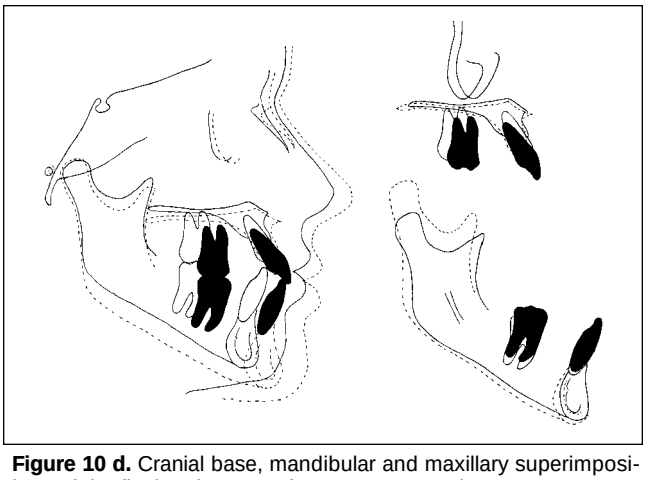


Figure 10 d. Cranial base, mandibular and maxillary superimpositions of the final and 5-year after treatment tracings.

The success of the orthopedic Class III treatment is related to the maxilla influence. The greater the maxilla component, the lesser the mandibular prognathism and a better prognostic is present.[10]

CONCLUSION

Class III malocclusion may be due to mandibular prognathism, maxilla retrognathism or a combination of

both conditions. But in some situations instead of a skeletal dysplasia, there is a mandibular protraction reflex and it is considered a functional or Pseudo-Class III. In the case reported, a functional Class III patient with slight skeletal components was successfully treated with reverse traction.

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