REVISTA MEXICANA DE ORTODONCIA

Clinical case

Early Class III Treatment, from a Functional Point of View

Rafael Ramirez Aviega

Facultad de Estudios Superiores-Iztacala

Corresponding author:
Rafael Ramirez Aviega
E-mail: drrafaorto@hotmail.com

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ABSTRACT

Introduction: A simple therapy is shown for the interception of class III malocclusion at an early age, emphasizing the importance of swallowing and breathing for adequate maxillary development, returning to the biological bases of occlusal and skeletal development. **Objective:** To identify dental or bone disharmonies during development, based on the knowledge of what is normal, knowing how to identify alterations early, how to intercept and not allow the development of a more serious malocclusion. **Case presentation:** Two clinical cases are shown, both dental class III and with respiratory problems; the first was a six-year-old girl, and the second was detected at three years of age. They were referred to the otorhinolaryngologist to treat the etiological factor, the correction of the airway. Orthodontic treatment focused on achieving an adequate relationship of the incisal guide of the permanent dentition so that once the respiratory and oral function are corrected, development occurs adequately. Radiographic monitoring was carried out every six months to assess changes and make therapeutic decisions until twelve and fifteen years of age respectively. Occlusal stability continues to be monitored without any unfavorable changes at the moment. **Conclusions:** Detecting alterations in growth and development at an early age helps to intercept both dental and bone malocclusions. Knowledge of basic sciences helps the clinician in making timely decisions during the patient's growth, and simple treatments may avoid unnecessarily invasive treatments.

Keywords: Class III, early treatment, simple therapy, mixed dentition.

INTRODUCTION

Researchers[1] have related Class III malocclusion to a genetic pattern, although studies have been carried out in monozygotic and dizygotic twins where environmental factors favor the development of Class III, hence the importance of early treatment[1,2]. At an early age, cephalometry is not usually reliable, since the samples on which they are based either do not include monozygotic and dizygotic twins or the sample is very small [3]. Class III may be from dental or skeletal origin: large mandible, hypoplasic maxilla, or a combination of both[4,5]. In children it is common to find pseudo class III, edge-to-edge anterior guidance that protrudes the mandible to have a more favorable posterior occlusion; in the absence of adequate anterior contact, proprioception extrudes the anterior teeth, both upper and lower, which inhibits maxillary anterior growth and will promote mandibular growth. A recent systematic review[6] reported an overall prevalence of Class III malocclusion within the range of 0% to 26.7% for different populations including Southeast Asian countries, where the Indian population had the lowest prevalence of 1.19% among all other racial groups. They are more prevalent in Hispanic groups than in African or Caucasian groups. A prevalence of approximately 9.1% and 8.3% was reported for Americans and Mexican Americans respectively, whereas among Europeans the incidence is 3% to 6%[6].

Environmental factors such as incorrect postural habits of the mandible pathologically alter the position of the mandibular condyle within the fossa, prolonged sucking habits or tongue rest, atypical swallowing, airway obstruction, mandibular functional changes due to respiratory needs, tongue size, pharyngeal airway shape and size, enlarged tonsils, large tongue, adenoids, hormonal imbalances and disorders such as gigantism or pituitary adenomas, trauma, premature loss of primary teeth, congenital anatomical defects such as cleft lip and palate (CLP), and dysfunction may occur alone or in combination[1,2]. At older ages, treatment can become more complicated, both for the patient and for the treating physicians. In children, orthopedic treatment involves the use of extraoral appliances, which may or may not be successful[7] depending on the patient's cooperation, while in adults, the treatment is orthodontic-surgical; Both therapies offer magnificent results. However, the longer the patient goes without correcting the malocclusion and facial disorders, his or her self-esteem and personality will likely be affected. Therefore, it is important to learn to distinguish the early characteristics of class III and eliminate the causal factors that distort the growth of the facial structures, as well as to undertake early therapeutic actions, which will not only help correct the problem but will also allow the body to recover the lost growth, i.e., to normalize the maxillomandibular development. Thus, the patient will have a harmonic growth of all dental and bone structures. Although it implies a long follow-up, this process requires clinical and radiographic supervision by the treating physicians, who help to detect and intercept changes in the normal growth pattern so that the malocclusion does not develop[2].

The face mask can be used to treat a maxillary deficiency, however, it can also cause a significant mesial migration of the upper teeth, pro inclining the anterior sector and decreasing the arch perimeter[5]. We must consider that in the long term, maxillary protraction relapses between 25% to 33%, once the mandibular growth has finished. For that reason, the use of bone anchorage is suggested to decrease the dentoalveolar effects[8]. Woon and Thiruvenkatachari[9] conclude that the face mask has positive dental and osseous effects and to a lesser degree, the chin cap, the tandem traction arch device, and the removable mandibular retractor. Success varies depending on patient cooperation, appliance comfort, and parental supervision[9].

Linder-Aronson *et al.*[10] have discussed the importance of genetic factors in the direction of mandibular growth, however, there are animal experiments[11] where external factors such as breathing and swallowing play a determining role in the shape the craniofacial complex will develop at growth[12,13]. Facial morphology and mandibular growth directions among primates[11] change if the mandible was chronically held in a low position. The continuous interaction between the nasomaxillary complex and the mandible during nasal breathing is important in guiding the growth of the entire skeletal-facial complex in a forward and horizontal orientation. This interaction decreases occlusal plane angulation, which shortens airway length, creates intraoral space to accommodate the tongue, leads to a shorter soft palate, and potentially improves the function of the airway dilator muscles to help keep the airway open[13].

Peltomäki[14] described that an obstruction in breathing affects craniofacial growth, leading to a skeletal class II relationship, because of more intense endochondral bone formation in the condylar cartilage; these children have abnormal nocturnal growth hormone (GH) secretion and impaired somatic growth, which normalizes after adenotonsillectomy (AAT). Decreased mandibular growth in children with adenoid facies is presumed to be due to abnormal secretion of GH and its mediators. After normalization of hormonal status, branchial growth and appositional bone growth at the lower border of the mandible are enhanced, by an increase in the level of hydroxyproline after AAT, suggesting an improvement in physical development[15]. This would explain, in part, the remarkable acceleration in mandibular growth and the alteration in its direction of growth, following the change in the mode of respiration after aat. Woodside *et al*.[15] suggest studying the influence of breathing on maxillary and somatic development since they noticed that when performing aat, the patient modifies the position of the head and the function of the tongue, changes from oral breathing to nasal breathing, and the maxilla also undergoes favorable changes in its growth, so they suggest to carry out studies on the subject, to favor patients who present maxillary hypoplasia[15].

In patients with CLP after maxillary traction therapy, improvement has been observed on pharyngeal airway dimensions as well as on jaw relationship; not only mild to moderate anterior crossbite is relieved, but also respiratory functions can potentially improve for preadolescent patients with CLP[16].

PRESENTATION OF CLINICAL CASES

Case 1

A six-year-old female patient attended the orthodontic clinic of fes Iztacala, she had a mesofacial profile, mild depression of the middle third, and a slightly convex profile (Figure 1). She presented an edge-to-edge anterior dental relationship, with anterior crowding, mild transverse collapse, and right and left class III molar relationship. The patient reported problems breathing through her nose and presented oral breathing. In the orthopantomography she showed radiographic crowding and lack of anterior and posterior space; the lateral cephalogram showed retroinclination of the upper and lower anterior incisors, considering that most cephalometric standards are not applicable in patients of this age (Figure 2). The patient was referred to the otolaryngologist, who in turn referred her to the allergist, where she was diagnosed with allergic rhinitis and hypertrophic nasal turbinates. She was prescribed vaccinations and no exposure to dust.

Figure 1. Initial photographs. Extraoral: front, profile, and smiling, highlighting the depression in the middle third of the face. Intraoral photographs: lateral and frontal.

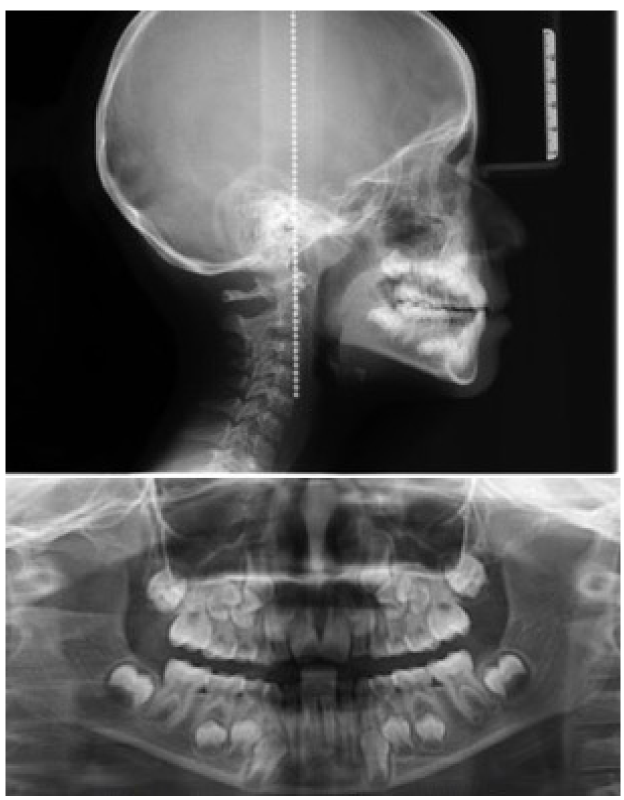

Figure 2. Imaging studies. Lateral skull radiograph, showing retroinclination of the incisors. Orthopantomography, showing dental crowding.

Once back to the orthodontic department, a Hyrax-type expansion screw with acrylic tracks and a lip bumper was placed to favor the transverse and anterior development of the maxilla and the lower dentoalveolar process (Figure 3). The maxilla advanced and the overjet improved. However, the space available for canines and premolars was not enough, so a cervical headgear (CHG) was used, with an orthodontic force of 200 grams per side, which allowed improving the space available for the permanent teeth. In addition, fixed appliances were placed to level the dentition and favor eruption of the permanent teeth. An orthopantomography was taken to assess the dental eruption process. Insufficient space was observed for eruption, so the upper first premolars were extracted. After a few months of proper use of the chg, the teeth erupted correctly, and only a slight correction with fixed appliances was required.

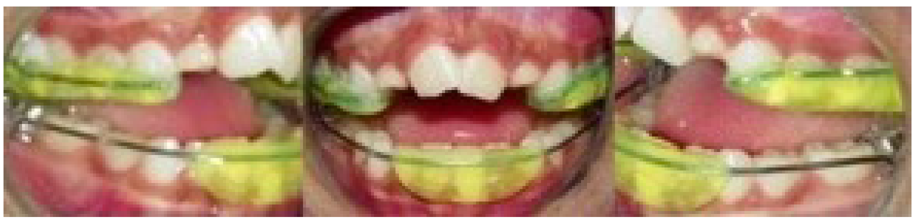

Figure 3. Intraoral photographs, showing the Hyrax and lower lip bumper.

Early orthopedic-orthodontic treatment favors a shorter bracket phase. In this way, dental movements were less. Therefore, the long-term stability of the treatment also offers a better prognosis. Both dental and skeletal results were acceptable and favorably influenced the patient's facial esthetics (Figure 4).

Figure 4. Final photographs. Extraoral: front, profile and smiling. Intraoral photographs: lateral and frontal.

Case 2

A three-year-old male patient presented a concave facial pattern and negative anterior overjet. He reported breathing problems and was referred to an otolaryngologist, who treated him for hypertrophic adenoids and turbinates; it should be noted that his 8-year-old brother was being treated with a facemask, so it was essential to intercept the class III malocclusion before it developed. Intraorally he presented a class III dental relationship with a negative overjet (Figure 5). Radiographically there was crowding and retroclined upper incisors (Figure 6).

Figure 5. Initial photographs. Extraoral: front, profile and smiling. Intraoral photographs: lateral and frontal.

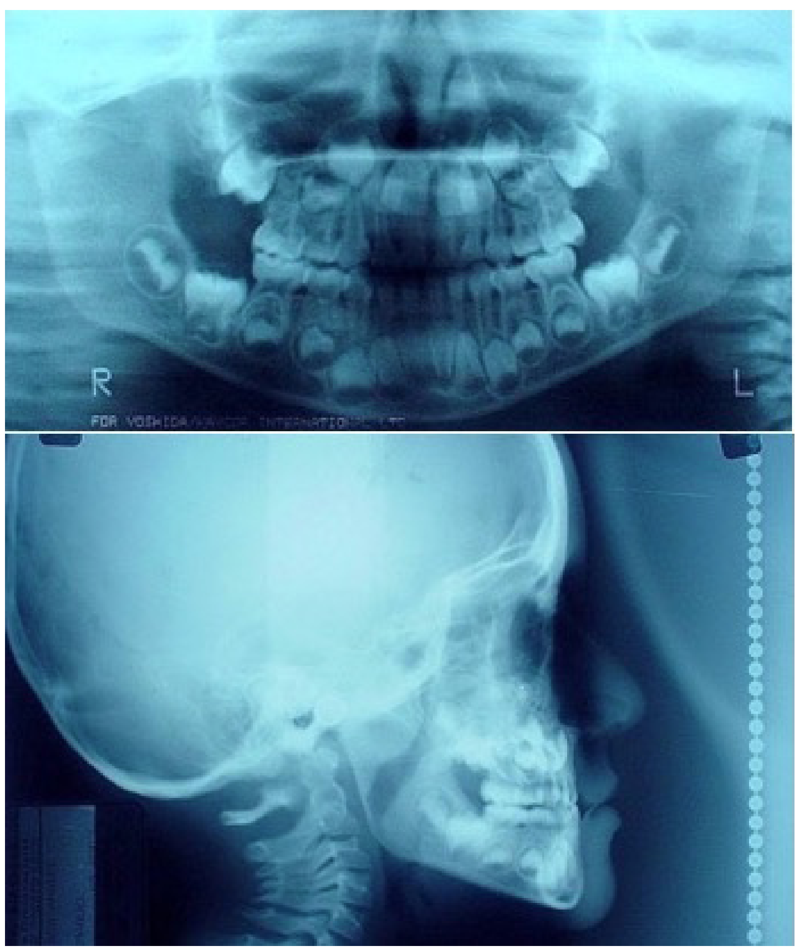

Figure 6. Imaging studies. Orthopantomography and lateral skull radiography, show the initial radiographic appearance of the patient.

Once the etiological factor was taken care of, the negative anterior relationship that limited the maxillary anterior development was corrected, and the upper primary incisors were proclined, thus changing the eruption guide of the permanent incisors, and correcting the negative overjet, which allowed for the maxillary development (Figure 7). Radiographic monitoring was performed every six months, indicating the need to provide space for the canines and upper premolars, so a cervical headgear (CHG) was placed with 200 grams of force (Figure 8). The corrected anterior guide allowed the correct anterior development of the maxilla, however, a Hass-type expansion plate was placed to improve the transverse development. With a new orthopantomography, the occlusion was clinically evaluated and once the necessary space was achieved, it allowed the adequate eruption (Figure 9). Space management was continued, and once the remaining teeth erupted, only a six-month phase of fixed appliances was given to adjust the occlusion (Figure 10).

Figure 7. Lateral and front intraoral photographs before and after the eruption of the permanent incisors.

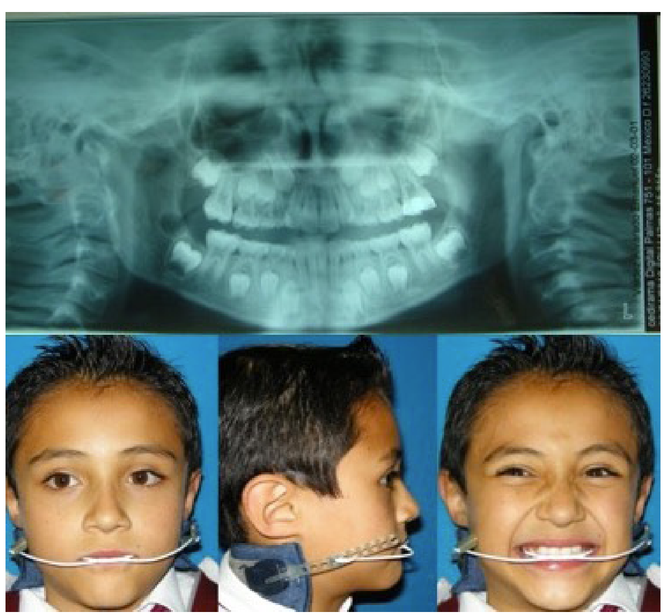

Figure 8. Follow-up images. Orthopantomography and extraoral photographs of the front, profile, and smiling with the placement of the extraoral cervical traction arch.

Figure 9. Front and lateral intraoral photographs show the dental expansion that favors the transversal development of the maxilla.

Figure 10. Follow-up photographs. Intraoral: front and lateral. Extraoral: front, profile and smiling.

DISCUSSION

Research by Kawala *et al.*[1] discuss a sample of 164 pairs of twins, stating that environmental factors have an unquestionable influence on the development of malocclusions; Taking this into consideration, it was decided to eliminate the possible etiology, and then only monitor normal maxillary development. If only genetics had an influence the problem would not have been corrected despite the change in function. Both patients had some type of airway obstruction, and when corrected, together with the treatment, we can assume that it helped improve maxillary growth, as suggested by Linder-Aronson *et al.*[10], Tomer and Harvold[11] and Bianchini *et al.*[12] Early treatment of anterior guidance in primary teeth favored the eruption guidance of permanent teeth, thus proprioception acted in favor of normal bone growth, as proposed by Zere *et al.*[2] The diagnosis of class III in growing patients is difficult to sustain, since bone growth has not yet been sufficiently expressed at early ages, and as mentioned by Flores *et al.*[3], Enlow *et al.*[17], and McNamara *et al.*[18] there is a difference between the cephalometric values of adults and those of children, so characteristics such as terminal planes, facial analysis and radiographic monitoring play a determining role in the diagnosis and evaluation of the progress of the treatment.

In case 1 a face mask was used for six months and, as mentioned by Nienkemper *et al.*[5], there was a molar migration that, despite the orthopedic change, decreased the arch perimeter, for the eruption of premolars and upper canines, the use of the headgear with orthodontic force, helped to recover the lost space in both cases. However, this side effect can be minimized by improving the anchorage of the intraoral device, or with the use of intraosseous anchorage, as suggested by Heymann *et al*.[8], although the orthopedic results obtained so far are not very different from the conventional face mask.

The cases hereby presented obtained good results. However, further research and a larger casuistry are required, adding computer tomography to radiographic monitoring, to analyze airway changes after the etiological factor has been eliminated, Also, pre and post-treatment hormonal profiles will allow to analyze growth hormone (GH) levels before and during therapy, as suggested by Peltomäki *et al.*[14]

CONCLUSIONS

Early diagnosis and treatment of Class III malocclusion is important to avoid further physical impairment.

Current orthopedic treatments may benefit from a better understanding of the impact of functional disharmonies on malocclusions.

It is possible to intercept a malocclusion if the physiological bases of normal growth are known and action is taken at the precise moment when it is altered by an abnormal function. This requires periodic monitoring of the patient throughout the growth phase.

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