

Orthopedic and orthodontic interceptive treatment of a class III malocclusion. A case report.

Allan Jay Bernal Fulgencio¹, Daniel Cerrillo Lara², Adrián Eduardo Espinoza Muñoz³, José Luis Pérez Vázquez⁴, Greda Berenice Ayllón Monteón⁵, Alicia Percevault Manzano⁶

¹(Orthodontic Specialty, Universidad Autónoma de Baja California, México)

²(Orthodontic Specialty, Universidad Autónoma de Baja California, México)

³(Orthodontic Specialty, Universidad Autónoma de Baja California, México)

⁴(Orthodontic Specialty, Universidad Autónoma de Baja California, México)

⁵(Orthodontic Specialty, Universidad Autónoma de Baja California, México)

⁶(Faculty of Odontology, Universidad Autónoma de Baja California, México)

Abstract:

Background: Class III malocclusion is caused by a maxillary deficiency, overgrowth of the jaw or a combination of both. The opportune treatment of a class III malocclusion may remove the option of an orthognathic surgery or in more severe cases reduce the surgery complications. Maxillary protraction and expansion are often used for orthopedic treatment and orthodontic apparatus for detailing and finishing in early stages of growth in patients.

Case Report: Male patient of 9 years and 8 months of age without personal pathological or allergic data, concave profile, brachyfacial biotype, horizontal growth, skeletal class III with mandibular prognathism, anterior and posterior crossbite.

Results: Skeletal class I is achieved, lip competence, facial harmony, molar and canine class I relationships, and the patient satisfaction.

Conclusion: Treating class III malocclusions with the correct diagnosis, plan and early treatment has more therapeutic opportunity for success, being the key factor the early treatment by observing the growth potential of the patient and plan accordingly, in this case presented the protraction mask in conjunction with the maxillary expansion made the orthodontic phase easier, obtaining the aesthetics and function established in the objectives.

Key Word: Class III, Malocclusion; Orthopedic; Interceptive; Orthodontic, Face Mask.

Date of Submission: 18-02-2021

Date of Acceptance: 03-03-2021

I. Introduction

A class III malocclusion is a heterogeneous dentofacial phenotype characterized by overgrowth of the jaw, maxillary deficiency, or a combination of both and can occur either as part of a syndrome or in isolation. The prevalence of Class III malocclusion varies from one population to another worldwide, with the lowest prevalence (up to 4%) occurring in the European-American and the highest prevalence (15-23%) in Asian populations. Class III malocclusion generally manifests from a very young age and is typically evidenced by an edge-to-edge incisal relationship or anterior crossbite. [1]

The opportune treatment of a class III malocclusion in a patient in growth with an orthopedic and orthodontic approach, being the protraction mask commonly used only or with a maxillary expansion appliance and detailing the case with orthodontic apparatus, may remove the option of considering an orthognathic surgery or reduce the complications in more severe cases. [2] The fundamentals of maxillary protraction therapy are based on the cellular response that occurs at the suture level, different events and factors that could affect the response of craniofacial sutures to mechanical stimuli have been reported. Orthopedic and orthodontic therapy and the treatment of many craniofacial deficiencies require, in most cases, a non-surgical modification of one or more craniofacial sutures. Other factors such as the amount, direction, and duration of force application play an essential role in the success of such treatments.[3] Among the various types of facial mask available, the Petit model is a mask that reduces care time and is also the best accepted by patients as it is a simpler model. Among the treatment strategies mentioned, the orthopedic face mask has the greatest application and produces the most effective results in the shortest period of time. These characteristics allow its use in most Class III patients in early mixed dentition or late deciduous dentition with a good prognosis.[4]

The protraction face mask has been used with considerable success in the treatment of class III patients with maxillary deficiency: in order to promote a favorable environment for normal growth and to improve occlusal relations. The therapeutic approach with a protraction face mask provides us with a constant anterior force in the maxilla. This is the indicated nonsurgical method of Class III correction for maxillary deficiency with the purpose of modifying and reorienting facial growth.[10]

Various clinicians have reported the benefits of palatal expansion as a routine part of Class III correction in conjunction with facemask therapy, being the benefits the expansion of a narrow maxilla, correction of posterior crossbite, conform upper arch, bite opening, loosening circum-maxillary sutures and downward and forward movement of the maxillary complex. Clinicians have indicated maxillary expansion a week before facemask therapy, and opting for a maxillary expansion with 2mm-3mm acrylic occlusal pads for optimizing time to crossbite correction and vertical dimension control. [11,12]

The objective of this publication is to show the case of a patient in 1st phase of mixed dentition with Class III malocclusion due to maxillary deficiency, treated with Petit's protraction mask and maxillary expansion as the first phase and orthodontic appliances as the second phase in the specialty of Orthodontics of the University Center for Research and Health of the Autonomous University of Baja California, Tijuana Campus.

II. Materials and Methods: Case Report

Male patient of 9 years and 8 months of age without personal pathological or allergic data. Mesomorph with apparent facial symmetry, concave profile, apparent inferior proclia. Brachyfacial biotype, horizontal growth, skeletal class III with mandibular prognathism, dentoalveolar proclination, mixed dentition, right side class III and left side class II molar, indeterminate canine class, anterior and posterior crossbite.

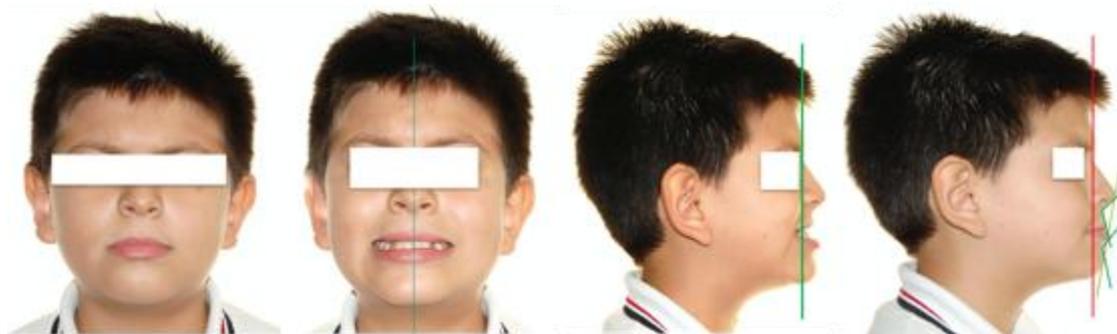


Figure 1. Facial photographs and analysis



Figure 2. Intraoral photographs

	NORM	PATIENT
SNA	82° ± 2	85°
SNB	80° ± 2	86°
ANB	2° ± 2	-1°
SND	76° ± 2	82°
Segment SL	51mm ± 2	53 mm
Segment SE	22mm ± 2	17 mm
Ang. Go-Gn / SN	32° ± 2	25°
Oclusal / SN	14° ± 2	9°
Ang. 1s / NA	22° ± 2	27°
Distance 1s / NA	4mm ± 2	4 mm
1s / ENA-ENP	70° ± 2	111°
Ang. 1s / SN	103° ± 2	112°
Ang. Ii / NB	25° ± 2	30°
Distance Ii / NB	4mm ± 2	5 mm
Ii / Go-Gn	90° ± 2	100°
Interincisal angle	131° ± 2	123°
Overbite	2.5mm	-2.5mm
Overjet	2.5mm	-2mm
Witts	0 mm	-3 mm.

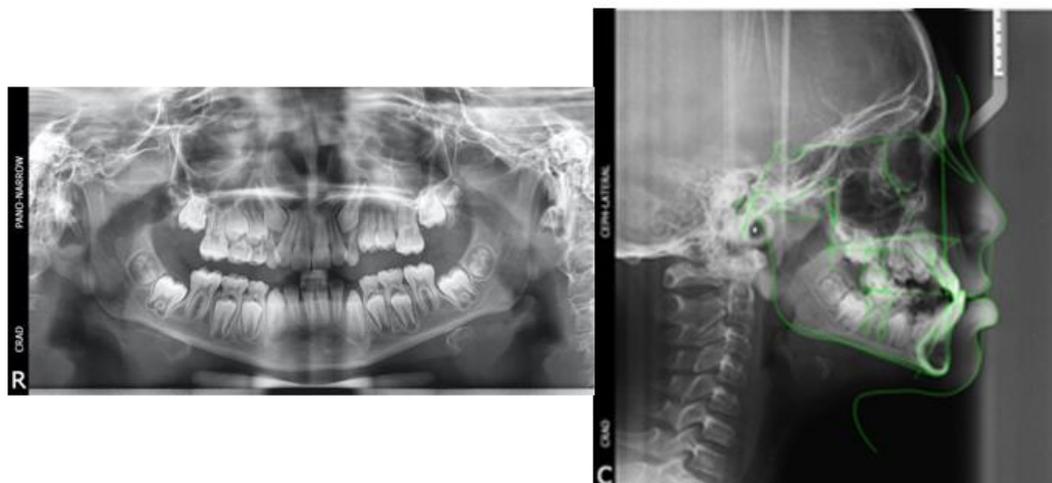


Figure 3. Radiograph studies from left to right: Panoramic x-ray, Lateral cephalogram and analysis summary

Case Report Location: This was a tertiary care teaching clinic-based study done in the Orthodontic Specialty, at Universidad Autónoma de Baja California, Campus Tijuana, México.

Treatment Plan

Phase I

Placement of rapid maxillary expander (McNamara type), Anterior inclined plane placement. Maxillary protraction mask (Petit type).

Phase II

Upper and lower fixed appliances (Alexander Slot 0.018x0.025"). Alignment and leveling. Upper and lower conformation with sequence of arches. Intermaxillary elastics with Class III Mechanics. Harmonization of arches. Root torque. Removable upper appliance retention, lower fixed retention.

Treatment Objectives

Obtain an aesthetic profile and facial harmony, correct the anterior and posterior crossbite, obtain class I molar and canine, correct overbite and overjet, midline correction, facial and dental stability, avoid a possible orthognathic surgery.

Case evolution

We initiated orthopedic phase with a maxillary expander with 3mm occlusal pads utilizing a ¼ turn per day (every 24hrs) for two weeks, and scheduling control appointments every two weeks.

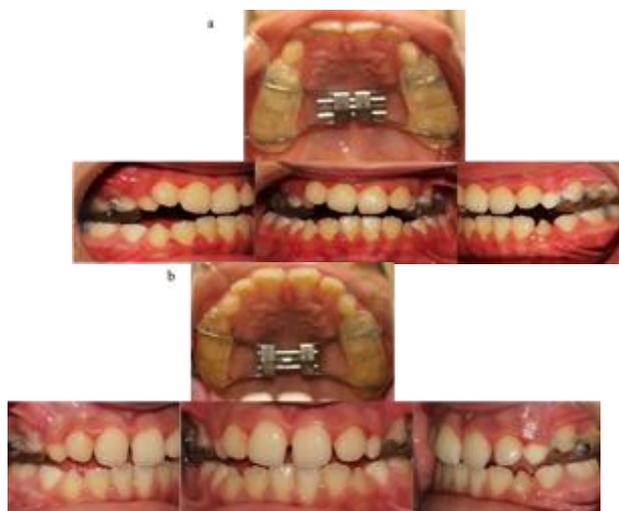


Figure 4. (a) Start of orthopedic phase with McNamara type maxillary expander, (b) Four weeks of maxillary expansion.

After four weeks of maxillary expansion and observing cross correction we sealed with composite the maxillary expander and commenced the use of the Petit face mask applying a low to high force elastic progression use and 18hr use of the face mask.

Being the first elastics 3/8 diameter and 8oz for two weeks, after we indicate the use of 1/2 diameter and 14oz for two weeks, and lastly, we use the 5/16 diameter and 14oz for the rest of the orthopedic phase, observing if the patient develops any skin rashes due to the use of the facemask if it presents, one can reduce the elastic force to alleviate the rash and after retake the optimal elastic force.

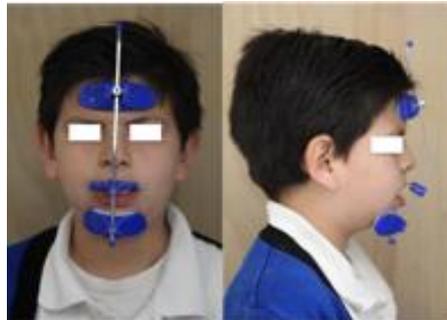


Figure 5. Petit type face mask.

After obtaining the desired results, we prolonged for a month the use of the facemask to maintain the result in the orthodontic phase.

Initiating the orthodontic phase with Alexander prescription slot 0.018", utilizing a 4x2 upper bonding, we bonded the molar tubes on the vestibular sides of the acrylic occlusal pads to overcorrect and preventing the secondary effects of the McNamara (that is intrusion of the posterior segments) with an advanced NiTi 0.014" arch wire.

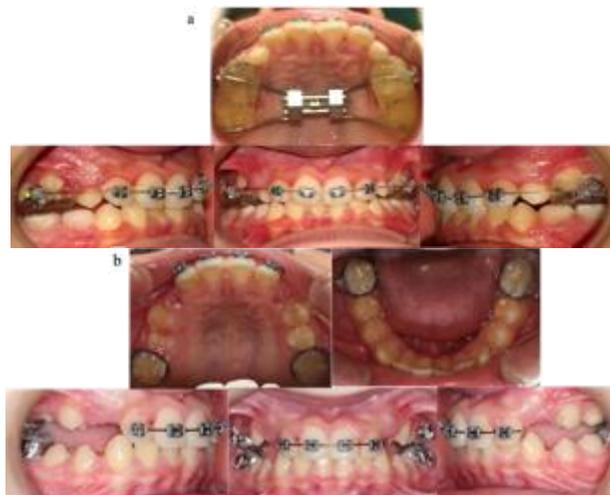


Figure 6. (a) Advanced NiTi 0.014" archwire, (b) After remotion of maxillary expander appliance, cemented first molar bands.

Progressing with the treatment we removed the maxillary expander appliance and cemented molar bands on the first molars, and inferior anterior bonding, observing the dental eruption, leveling and conforming with the arch wire sequence (NiTi 0.014"-NiTi 0.016"- NiTi 0.016x0.016"- SS 0.016x0.022" upper and lower).



Figure 7. (a) 4x2 bonding protocol, (b) treatment progression.



Figure 8. Facial treatment progression photographs.

III. Results

Duration of the orthopedic phase 7 months with favorable results, achieving uncrossing of the bite using a McNamara-type expander and a Petit-type protraction mask.

Duration of the orthodontic phase 3 years with favorable results achieving occlusal function, molar and canine class I, a favorable profile, facial harmony and patient satisfaction. Initiating the retention phase with removable upper retention and fixed lower retention.



Figure 9. (a) Final intraoral photographs, (b) Laterotrusion and protrusion anterior occlusion guide

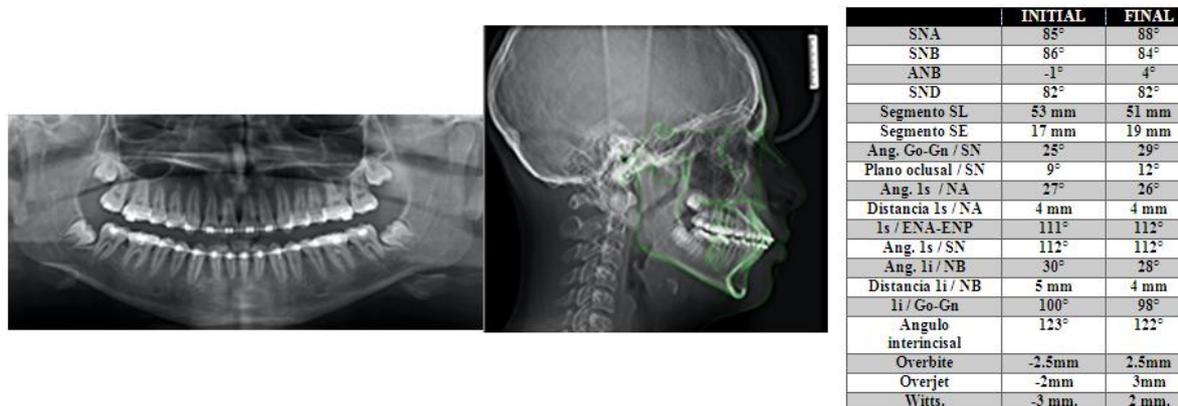


Figure 10. Final radiographs and lateral cephalogram analysis initial and final.

Comparing the initial lateral analysis to the final we see that now it shows a slightly vertical growth pattern (Go-Gn/SN 29°) an overbite and overjet in norm range (overbite 2.5mm, over jet 3mm), and a Witts of 2mm; but maintaining the upper dentoalveolar proclination a measurement to observe clinically if it not develops instability in the future.

Follow up after 6 months



In the last control appointment, we observed the patient maintained the occlusal function and facial aesthetic that the we obtained with the orthopedic and orthodontic treatment.

IV. Discussion

The convenience or not of treating the patient with class III malocclusion early has been discussed in relation to the stability of the achievements once the patient reaches puberty and experiences its maximum growth peak. [5,6]

It is also recommended that after protraction facial mask therapy the patient wear removable orthopedic appliances for at least 1 year, which added to the over correction achieved with the mask will provide greater stability, this was verified in patients treated at ages early. [7,8]

In the case presented we can see the benefits of treating early a class III malocclusion utilizing an orthopedic approach, achieving a correction of not only the crossbite but the facial profile.

The result of the treatment early class III malocclusions when using the facial mask of protraction has a favorable prognosis and easy acceptance by patients. Skeletal changes are evident, with correct case control through analysis of serial lateral radiographs one can assure the stability of the results obtained. In multiple follow-up studies in patients treated with this therapy, stability was observed 8 years after the end of it. At 18 years of age, 67% of the individuals treated with facial protraction mask and maxillary orthopedics have achieved the objective of combined therapy. This indicates that only 1/3 of patients could be a candidate for orthognathic surgery due to an unfavorable growth pattern of the jaw. [6,9] The data are controversial regarding the parameters to take into account. A recent systematic review concluded that there is no scientific evidence that allows the definition of adequate parameters for the strength, magnitude, direction and duration of treatment with the maxillary protraction mask in patients with Class III malocclusion. [10,14] Rapid maxillary expansion in combination with maxillary protraction is well documented in the literature with relatively stable results, regardless of the presence of a crossbite. Orthopedic disjunction of the sutures facilitates protraction with normal growth of the maxilla, which has a downward and forward displacement. [11,12, 13,15]

The patient showed a more convex facial profile and an adequate overbite and overjet in relation to the records initially taken. The soft tissue changes are the result of the underlying skeletal movement induced by orthodontic treatment. Important soft tissue changes are the position of the upper lip, and the chin. The forward movement of the upper lip was the highlight, this explains the change in the soft profile shown in the control photos.

It was decided to place brackets during the process in a 4x2 system to improve the correction, and control the dental eruption phase it is understood that the changes achieved are skeletal and dental, which could be corroborated in the cephalometries during and post-treatment.

An accurate diagnosis and an understanding of the individual growth pattern are crucial in determining the opportune timing for treatment of class III patients. In the case of therapy with the protraction facial mask, the optimal results will be achieved if this treatment is started in the deciduous dentition and in the early mixed dentition to take advantage of the sutural response, at the same time improving the facial profile.

V. Conclusion

Treating a class III malocclusion “on time” with the correct diagnosis and treatment select can achieve the objectives one establishes of function and aesthetic, in our case observing the growing stage of the patient and deciding to intervene with an orthopedic approach initially and then an orthodontic phase we obtained a correct occlusal function and facial aesthetic. The importance of early care of patients with class III malocclusions lies in the prevention of irreversible changes in bone and soft tissues, in the improvement of the spatial relationships of the teeth, in the optimization of the occlusal function and in many cases reducing the need orthognathic surgery. The follow-up of these patients before and after the end of the treatment determines the prognosis of the same.

References

- [1]. Singh GD. Morphologic determinants in the etiology of class III malocclusions: a review. *Clin Anat.* 1999; 12(5):382-405.
- [2]. Kapust, A.J. Cephalometric effects of face mask/expansion therapy in Class III children: A comparison of three age groups. *American Journal of Orthodontics and Dentofacial Orthopedics.* Volume 113, Issue 2, February 1998, Pages 204-212.
- [3]. Baccetti, T. Skeletal effects of early treatment of Class III malocclusion with maxillary expansion and face-mask therapy. *American Journal of Orthodontics and Dentofacial Orthopedics.* Volume 113, Issue 3, March 1998, Pages 333-343.
- [4]. McNamara J. The face mask. In: McNamara JA, Brudon WL. *Orthodontic and orthopedic treatment in mixed dentition.* México City: Editorial Needham Press; 1995.p. 285-295.
- [5]. Ngan P. Early treatment of Class III malocclusion: Is it worth the burden? *Am J Orthod Dentofacial Orthop* 2006;129 (1): s 82-85
- [6]. Ngan P. Early Timely Treatment of Class III Malocclusion. *Semin Orthod* 2005;11:140-145.
- [7]. Vaughn GA, Mason B, Moon HB, Turley PK. The effects of maxillary protraction therapy with or without rapid palatal expansion: A prospective, randomised clinical trial. *Am J Orthod Dentofacial Orthop* 2005(3);128:299-309.
- [8]. Baccetti T, McGill JS, Franchi L, McNamara JA Jr, Tollaro I. Skeletal effects of early treatment of Class III malocclusion with maxillary expansion and face-mask therapy. *Am J Orthod Dentofacial Orthop* 1998(3);113:333-343
- [9]. Henry Franchi L, Baccetti T, Tollaro I. Predictive variables for the outcome of early functional treatment of Class III malocclusion. *Am J Orthod Dentofacial Orthop* 1997(1); 112:80-86

- [10]. Kim JH, Viana MA, Graber TM, et al. The effectiveness of protraction face mask therapy: a meta-analysis. *Am J Orthod Dentofacial Orthop.* 1999;115(6):675-685.
- [11]. Turley P. Treatment of the Class III malocclusion with maxillary expansion and protraction. *Semin Orthod.* 2007; 13(3): 143-157. Principal results from EUROASPIRE II. *Eur Heart J* 2001;22:554-572.
- [12]. Williams MD, Sarver DM, Sadowsky PL, Bradley E. Combined rapid maxillary expansion and protraction facemask in the treatment of class III malocclusions in growing children: A prospective long-term study. *Semin Orthod* 1997;3(6):265-274.
- [13]. Cordasco G, Matarese G, Rustico L, et al. Efficacy of orthopedic treatment with protraction facemask on skeletal Class III malocclusion: a systematic review and meta-analysis. *Orthod Craniofac Res.* 2014;17(3):133-43.
- [14]. Yepes E, Quintero P, Rueda Z, et al. Optimal force for maxillary protraction facemask therapy in the early treatment of class III malocclusion. *Eur J Orthod.* 2014;36(5):586-594.
- [15]. Bavbek NC, Tuncer BB, Tortop T. Soft tissue alterations following protraction approaches with and without rapid maxillary expansion. *J Clin Pediatr Dent.* 2014; 38(3):277-283.

Allan Jay Bernal Fulgencio, et. al. "Orthopedic and orthodontic interceptive treatment of a class III malocclusion. A case report. " *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 20(03), 2021, pp. 10-17.