MAXILLARY EXPANSION, CONSTRICTION AND PROTRACTION THROUGH FACIAL MASK TO CORRECT ANTERIOR CROSSBITE: CASE REPORT

Nayara Priscilla Pereira **Lemos**[1*], Livia Helena Lourenço Leal **Amoroso**[1], Erika Josgrilberg **Guimarães**[1], Natália Pereira de **Oliveira**[1] e Renata Pilli **Jóias**[1].

[1]Methodist University of São Paulo - Faculty of Medical Sciences and Health, SãoPaulo, SP, Brazil.

Palavras-chave: Má Oclusão. Expansão Maxilar. Mordida Cruzada.

RESUMO

Introdução: A protração maxilar associado ou não à expansão rápida da maxila (ERM) apresenta-se como terapia de escolha de maloclusão de Classe III esquelética por deficiência maxilar numa fase precoce da vida. **Objetivo:** Relatar caso clínico de expansão e constrição rápida da maxila com protração maxilar em indivíduo Classe III esquelética com dentição mista. **Relato:** Paciente com 9 anos e 3 meses de idade, maloclusão de Classe III esquelética e mordida cruzada anterior de -3mm foi tratado com expansor do tipo Hyrax, usando protocolo de expansão e constrição da maxila associada a tração reversa com máscara facial de Petit. Durante 4 dias foram realizadas expansão do disjuntor em 2/4 de volta pela manhã e constrição de 2/4 de volta pela noite. Após esse período o paciente utilizou a máscara facial com força de 500N por um período de 14 horas por dia, durante 3 meses. Alcançada a sobrecorreção a máscara foi utilizada durante o período noturno com força de 300N. **Resultados:** Observou-se sobressaliência de 2,5mm, boa relação transversal interarcos e bom perfil facial. **Conclusão:** O protocolo de expansão e constrição maxilar seguido de tração reversa com máscara de Petit foi eficaz na correção da mordida cruzada anterior de indivíduo com maloclusão de Classe III esquelética precoce por deficiência antero-posterior da maxila.

Keywords: Malocclusion. Palatal Expansion Technique. Crossbite.

ABSTRACT

Introduction: Maxillary protraction with or without rapid maxillary expansion (RME) is the therapy of choice for early skeletal Class III malocclusion caused by maxillary deficiency. **Objective:** To report a clinical case of rapid maxillary expansion and constriction with maxillary protraction in boy with skeletal Class III at mixed dentition. **Report:** A boy aged 9 years and 3 months, with skeletal Class III malocclusion and anterior crossbite of -3mm was treated with a protocol of maxillary expansion and constriction by Hyrax expander associated with maxillary protraction by Petit facial mask. For 4 days, the expander was opened by 2/4 turn in the morning and closed by 2/4 turn in the evening. Elapsed that period, the boy wore the face mask delivering 500N force, for 14 hours per day, for 3 months. After overcorrection, the mask was used during the night delivering a 300N force. **Results:** The treatment achieved a 2.5mm overjet, with good maxilla-mandible transversal relationship and good facial profile. **Conclusion:** The protocol of maxillary expansion and constriction followed by maxillary protraction with Petit mask was effective to correct the anterior crossbite and the early skeletal Class III malocclusion caused by anterior-posterior maxillary deficiency.

Submitted: May 5, 2018
Modification: December 17, 2018
Accepted:January 8, 2019

***Correspondence to**:
Nayara Priscilla Pereira Lemos
Address: Rua Braga, 201, casa 24. Vila Lusitânia, São Bernardo do Campo, SP, Brazil.
Telephone Number: +55 (11) 96727-5341.
E-mail: nayarapereira.lemos@gmail.com

INTRODUCTION

Skeletal Class III malocclusion results of the lack of simultaneous sagittal growth between the maxilla and mandible. Thus, skeletal Class III malocclusion can be characterized by maxillary retrognathism, mandibular prognathism, or both, regardless of the sagittal relation between dental arches.[1-5] Individuals with skeletal Class III malocclusion have concave profile caused by facial medium third deficiency, lack of zygomatic prominence, and excess of the facial lower third. Moreover, maxillary atresia, lower lip protrusion, and anterior crossbite may be present.[4,6]

About 3% of Brazilian children at mixed dentition have posterior crossbite[7]. Because of greater orthopedic than orthodontic effects, Class III malocclusion must be diagnosed and treated at deciduous or mixed dentition due to better prognosis before the pubertal growth spurt between 4 and 12 years-old, with differences between boys and girls.[1-2,5-6,8] The literature reports that rapid maxillary expansion RME with or without maxillary protraction is the best early treatment for growing individuals with short-term good outcomes.[2-5,9,12-13]

The facial mask is used to achieve maxillary protraction and anterior displacement, delivering directed and constant orthopedic forces.[2-4,14] The literature reports different types of facial masks as follows: Delaire, Petit, Turley, Sky Hook, among others.[1-3,8-10] The magnitude, vector direction of the applied force, and number of hours used during the day are extremely important for treatment success.[1-3,6,8,10,14,15]

Early treatment advantage is the easy palatal disjunction, which may eliminate or decrease the possibility of further surgical intervention.[2,8] The protocol of maxillary expansion and constriction consists of alternating movements of rapid expansion and constriction of the maxilla, mainly aiming at greater maxillary expansion, enabling greater maxillary protraction, because the protraction effectiveness depending on the opening of the surrounding maxillary sutures.[5]

Taking into consideration the successful orthopedic treatment of the skeletal Class III malocclusion by maxillary protraction and the different protocols for the prior adjustment of the transversal maxillary dimension, no consensus exists on RME effect on the maxillary repositioning. Therefore, this study aimed to report the maxillary expansion and constriction with maxillary protraction in a boy with skeletal Class III at mixed dentition.

CASE REPORT

Patient G.C.C., male, aged 9 years and 3 months, sought the Clinics of Orthodontics of the Methodist University of Sao Paulo, with main complaint of "very forward lower teeth". At extraoral examination, we observed a concave profile with lower lip protrusion, lack of zygomatic prominence, and deeper nasolabial groove at smile (Figure 1B). At intraoral examination, the boy was at the second transitional period of mixed dentition, with Angle's Class III malocclusion, overjet of -3mm, overbite of 6mm, anterior-inferior crowding of 2.1mm, no dental rotations, and no posterior crossbite (Figures 2A, B, C, D, and E).

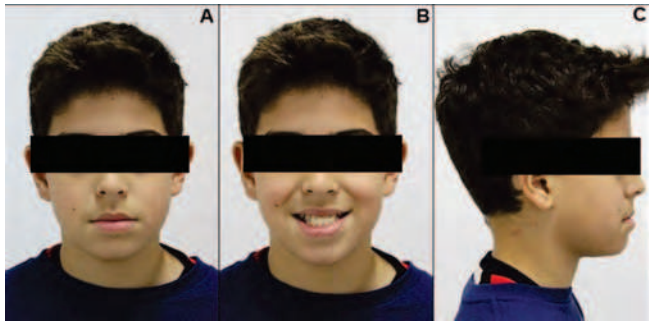


***Figure 1**: Initial extraoral photographs: A) frontal view; B) smile view; C) lateral view.*



***Figure 2**: Initial intraoral photographs: A) right; B) left; C) frontal view; D) maxillary occlusal view; E) mandibular occlusal view.*

The panoramic radiograph revealed the presence of the mandibular premolar buds (Figure 3B). The pre-treatment lateral cephalogram (T0) showed biprotrusion (SNA=87.5°, SNB=88.0°, A-N Perp=3.0 mm, Pog Perp=6.0 mm), skeletal Class III (NB=1.30), severe brachyfacial pattern (VERT=1.03), and neutral growth direction (Jaraback's quotient=60.6%). The maxillary incisors were shifted to palatal direction (1.NA=20°) and retruded (1-NA=4mm); the

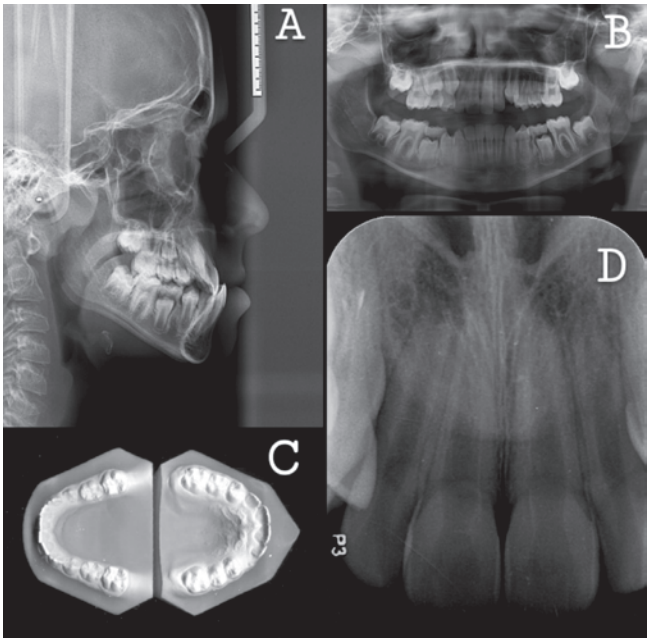


***Figure 3**: Pre-treatment files: A) Lateral cephalogram; B) Panoramic radiograph; C) Study casts; D) Periapical radiograph before palatal sutute disjunction.*

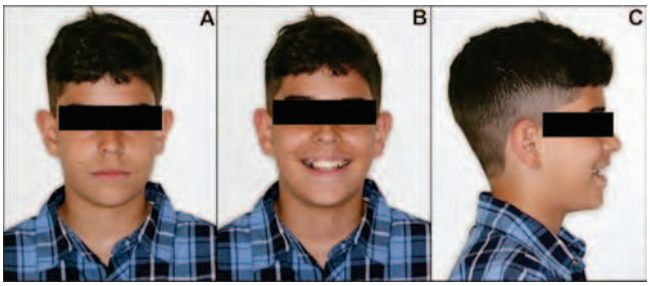


***Figure 4**: Post-treatment extraoral photographs: A) frontal view; B) smile view; C) lateral view.*

mandibular incisors were at normal position (1.NB=25.89°), slightly lingualized (IMPA=81.51°), and protruded. The anterior skull base/mandibular length proportion was smaller than 1:1, because the anterior skull base (S-N) had 66mm and the mandibular body length (Go-Me) 75mm.

The treatment approach and execution were explained to the boy and his parents. The parents signed a free and clarified consent form and agreed with the participation in this case report. The proposed treatment was the expansion and constriction of the maxilla associated with the maxillary protraction with facial mask.

A Hyrax expander was installed, and the expander thread was opened 2/4 turn in the morning and closed 2/4 turn in the night for 4 days. Elapsed that time, after the disjunction of the palatal suture (Figures 3D and 6B), the Petit facial mask was installed, delivering a force of 500N. The boy was instructed to use the mask for 14 hours/day, for 3 months. After that, the boy used the facial mask only during the night (20 p.m. to 7 a.m.), delivering a force of 300N to 350N, on each side. The treatment length was 9 months (Figures 4 and 5). After treatment (T1), the lateral cephalogram (Figure 6A) showed the improvement of the profile. Dental casts were obtained to measure the clinical parameters (Table 1).

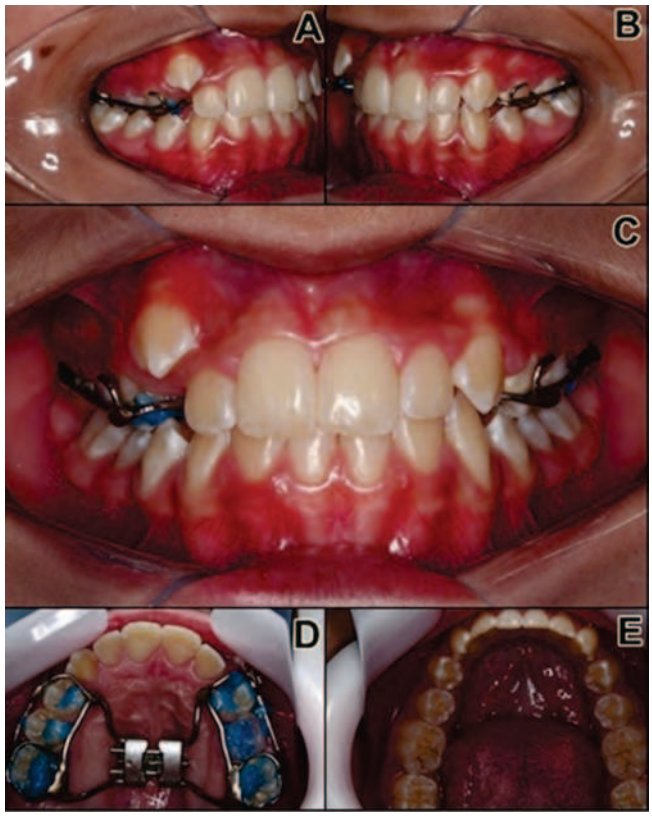


***Figure 5**: Post-treatment extraoral photographs: A) right; B) left; C) frontal view; D) maxillary occlusal view; E) mandibular occlusal view.*

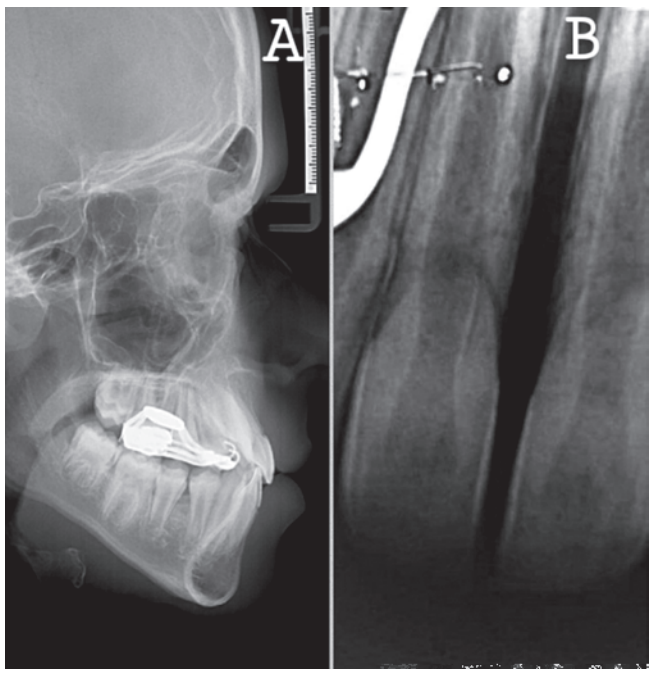


***Figure 6**: Post-treatment files: A) Lateral cephalogram; B) Periapical radiograph after the palatal suture disjunction.*

***Table 1**: Clinical and radiographic parameters between T0 and T1.*

	T0	T1
SNA	87,5°	93,0°
zSNB	88,0°	91,0°
A-N Perp	3,0 mm	3,0 mm
P-N Perp	6,0 mm	4,0 mm
1.NA	20,0°	25,0°
1-NA	4,0 mm	5,5 mm
AFAI (Ena-Me)	62,0 mm	64,0 mm
NAP	0,0°	4,0°
A-B Ocl	-11,0 mm	-6,0 mm
Sobremordida	6 mm	5 mm
Sobresaliência	- 3 mm	2,5 mm

DISCUSSION

The proposed treatment consisting of maxillary expansion and constriction followed by maxillary protraction with facial mask resulted in satisfactory skeletal, dental, and facial parameters, which agreed with the literature.[2,5,9,13] The comparison of pre-and post-treatment cephalogram revealed the overjet increasing of 5.5 mm, evidenced by the anterior crossbite correction and good sagittal relation. Before treatment, the boy had a concave facial profile that changed to a straight profile after treatment. Moreover, the zygomatic volume of the maxilla increased. The sagittal discrepancy between the maxilla and mandible decreased 5 mm. At the ending of the treatment, the boy exhibited Angle's Class I relation.

The literature recommends that Class III treatment should be provided as soon as possible, at deciduous or mixed dentition. A better prognosis occur before the pubertal growth spurt, i.e., between 4 and 12 years-old.[1-2,6-8,9-11] It is worth noting that atresic dental arches should be treated by slow expansion, while skeletal atresia by RME.[16]

Despite several early Class III treatment approaches, RME with or without maxillary protraction is the most used treatment for growing individuals.[2-4,11] Other alternative is Liou protocol consisting of the maxillary expansion and constriction aiming to achieve greater maxillary expansion, enabling greater and more effective protraction, thus depending on the opening of the surrounding maxillary sutures.[5,17] Liou protocol lasts 7 weeks and comprises the expander opening for one week followed by similar expander closure in the next week, repeated for 6 weeks; in the last week the expander is opened.[4-5,17] The minimum recommended daily use of the facial mask is 12 to 14 hours per day.[1-3,7,15] Studies report statistically significant differences favoring Liou protocol, but further longitudinal studies are necessary.[4-5,11-13,17]

This case report exhibited the treatment with a modified Liou protocol with favorable outcomes. The one-week expansion followed by one-week constriction of Liou protocol may damage the periodontium leading to gingival recession. The modified protocol used in this case report – opening and closure of the expander thread at the same day – would prevent periodontal damage[16]. The literature reveals similar effects on soft profile, such as lip, with both protocols[4]. Clinical studies not only show the maxillary displacement downwards and forwards, but also the clockwise rotation of the mandible, as well as the increasing of the anterior-inferior facial height, increasing of the facial convexity, anterior displacement of the maxillary dental arch, and lingualization of the mandibular incisors.[1-2,8,14]

The most used orthopedic appliance for RME is Haas expander, a tooth-tissue-borne appliance. Tooth-borne appliances, such as Hyrax and McNamara, are similarly effective.[1-2,4,6-8,9-11,13] The active RME phase begins 24 hours after the expander installation, by opening 2/4 turn in the morning and 2/4 turn in the evening.[16] RME aims at the palatal suture disjunction to increase the protraction results, as well as the increase of the transversal dimension, which would favor the correction of Class III discrepancy.[10] The associated protocol and patient's compliance is mandatory for treatment success.

In this case report, the protocol of maxillary expansion and constriction associated with maxillary protraction was effective to correct the anterior crossbite in a boy with skeletal Class III, suggesting that RME potentializes and influences positively on the maxillary repositioning. Further studies with longer following-up periods are still necessary.

REFERENCES

1. Rodrigues LRL, Baddredine FR, Jr. MC, França NM. Protração maxilar associada à disjunção maxilar ortopédica. Rev. Clin. Ortodon. Dental Press. 2007 jun-jul; 6(3).

2. Thiesen G, Fontes JOL, Zastrow MD, Lima MH, Nuernberg N. Tração reversa da maxila associada à mecânica intermaxilar no tratamento precoce do Padrão III: relato de caso. Rev. Clín. Ortodon. Dental Press. 2009 ago-set; 8(4).

3. Perrone APR, Mucha JN. O tratamento da Classe III - revisão sistemática - Parte I. Magnitude, direção e duração das forças na protração maxilar. R Dental Press Ortodon Ortop Facial. 2009 set-out; 14(5).

4. Gourgues LJ. Avaliação de Pacientes Classe III submetidos à expansão e protração maxilar através de dois difetentes protocolos de expansão – Controle de 12 meses. Porto Alegre. 2012.

5. Pithon MM, Santos NL, Santos CRB, Baião FCS, Pinheiro MCR, Matos Neto M, et al. Is alternate rapid maxillary expansion and constriction an effective protocol in the treatment of Class III malocclusion? A systematic review. Dental Press J Orthod. 2016 Nov-Dec; 21(6):34-42.

6. Oltramari Navarro PVP, de Almeida R, Ferreira Conti ACdC, Navarro RdL, de Almeida MR, Ferreira Parron Fernandes LS. Early Treatment Protocol for Skeletal Classe III Malocclusion. Braz Dent J. 2013;24(2).7. Brasil. Ministério da Saúde. Projeto SB Brasil 2010: pesquisa nacional de saúde buccal - resultados principais. Brasília: Ministério da Saúde; 2012.

8. Primo BT, Eidt VS, Gregianin JA, Primo NA, Faraco Junior IM. Terapia da tração reversa maxilar com máscara facial de Petit - relato de caso. RFO, Passo Fundo. 2010 maio-ago;15(2).

9. Vedovello SAS, Valdrighi H, Manhães FR, Vedovello Filho M, Santamaria Junior M. Tratamento precoce de má oclusão de Classe III com máscara de protração maxilar associada a elástico intrabucal. Rev Clín Ortodon Dental Press. 2012 jun-jul:11(3):90-7.

10. Penhavel RA, Saravia SAN, Bandeca AG, Freitas KMS, Valarelli FP, Cançado RH. Tratamento precoce de má oclusão de Classe III associando ERM e protração maxilar: relato de caso. Rev Clín Ortod Dental Press. 2016 Fev Mar; 15(1):55-67.

11. Camargo CK. Protração maxilar após dois protocolos de expansão: existe diferença? V Mostra de Pesquisa da Pós Graduação - PUCRS. 2010.

12. Canturk H, Celikoglu M. Comparison of the effects of face mask treatment started simultaneously ad after the completion of the alternate rapid maxillary expansion and constriction procedure. Angle Orthod. 2015 July; 85(2).

13. Liu W, Zhou Y, Wang X, Liu D, Zhou S. Effect of maxillary protraction with alternating rapid palatal expansion anda constriction vs expansion alone in maxillary retrusive patients: A single-center, randomized controlled trial. Am J Orthod Dentofacial Orthop. 2015 October; 148(4).14 Zhang W, Qu HC, Yu M, Zhang Y. The Effects of Maxillary Protraction with or without Rapid Maxillary Expansion and Age Factors in Treating Class III Malocclusion: A Meta-Analysis. PLOS ONE. 2015 June; 11.

15. Cordasco G, Mataese G, Rustico L, Fastuca S, Caprioglio A, Lindauer SJ, et al. Efficacy of orthopedic treatment with protraction facemasck on skeletal Class III malocclusion: a systematic review and meta-analysis. Orthod Craniofac Res. 2014 March; 17.

16. Filho LC, Filho OGS. Expansão Rápida da Maxila: Considerações Gerais e Aplicação Clínica. Parte I. R Dental Press Ortodon Ortop Maxilar. 1997 maio-jun; 2(3)

17. Liou EJW, Tsai WC. A New Protocol for Maxillary Protraction in Cleft Patients: Repetitive Weekly Protocol of Alternative Rapid Maxillary Expansions and Constrictions. The Cleft Palate-Craniofacial Journal, 42(2), 121–127.