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EARLY TREATMENT OF A PRESCHOOL CHILD'S CROSSBITE USING DIRECT DENTAL TRACKS, THREE-YEAR FOLLOW-UP - CLINICAL CASE REPORT

Ana Carolina Costa da Mota Ciarcia, Marcos Fernando Xisto Braga Cavalcanti, Francesca Diomede, Maria Priscila de Souza Monteiro Pugliesi, Silvia Regina Garcia Olivan , Olga Maria Altavista

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CASE REPORT

ABSTRACT

Background

The treatment of young children can be difficult even for trained professionals.

The prevalence of malocclusion in this phase of development can vary widely according to the population studied, and more specifically, to their genetic heritage. However, physical stimuli, such as habits, can also lead to a lack of proportionality in the craniofacial skeleton.

Case Report

This paper reports the treatment of C. M. R., a 4-year-old female preschooler, who presented with anterior and posterior crossbites, second molars exhibiting mesial terminal steps, and a negative overject.

This case was treated using Direct Dental Tracks to correct the malocclusion, and the patient was followed for three years.

Final considerations

This treatment was successful in restoring her craniofacial growth and development to the normal individual pattern. The patient is ready to begin the follow-up phase of occlusal development using Planas functional orthopedic appliances until final occlusion is established with the second molars in occlusion.

Keywords: Crossbite, Direct dental tracks, Dental orthopedics

TRÊS ANOS DE ACOMPANHAMENTO DO TRATAMENTO INTERCEPTADOR DE UMA CRIANÇA NA PRIMEIRA INFÂNCIA COM MORDIDA CRUZADA UTILIZANDO PLANOS INCLINADOS - RELATO DE CASO CLÍNICO

RESUMO

Contexto

O tratamento de crianças pequenas pode ser difícil até mesmo para profissionais treinados.

A prevalência de má oclusão nessa fase do desenvolvimento pode variar amplamente de acordo com a população estudada e, mais profundamente, devido à sua herança genética, entretanto, estímulos físicos, como hábitos, também podem levar a uma falta de proporcionalidade no esqueleto craniofacial.

Relato de Caso Clínico

Este artigo relata o tratamento de C. M. R., uma menina de 4 anos de idade, que apresentava mordida cruzada anterior e posterior, segundos molares com degraus mesiais terminais e trespasse horizontal negativo.

Este caso foi tratado utilizando Planos inclinados para corrigir a má oclusão, e a paciente foi acompanhada por três anos.

Considerações Finais

Este tratamento foi bem-sucedido em restaurar seu crescimento e desenvolvimento craniofacial ao padrão normal individual. A paciente está pronta para iniciar a fase de acompanhamento do desenvolvimento da oclusão utilizando aparelhos ortopédicos funcionais de Planas, até a oclusão final ser estabelecida com segundos molares em oclusão.

Palavras-chave: Mordida cruzada, Planos inclinados, Ortopedia dentária

Affiliated institution:: 1- Pediatric Dentist, student of the specialization course in Orthodontics at Nove de Julho University
2- Professor of the specialization course in Orthodontics at Nove de Julho University
3- Professor of the Children's Clinic discipline of the undergraduate course in Dentistry at Nove de Julho University
4- Postdoctoral student at the Development and Innovation Laboratory of the Butantan Institute
5-Pediatric Dentist, Reseacher at Università degli StudyPescara-chieti University

Corresponding Author::
Prof. Dr. Marcos Fernando Xisto Braga Cavalcanti – mxistocavalcanti@gmail.com

INTRODUCTION

Malocclusions are a combination of environmental, epigenetic, and hereditary factors [1]. Posterior crossbites occur when buccal cusps of one or more posterior upper teeth contact the central fossa of the posterior lower teeth, and the lingual cusps of one or more posterior lower teeth contact the central fossa of the upper posterior teeth; in the anterior region crossbites occur when one or more anterior teeth contact the buccal surface of one or more upper anterior teeth with the lingual surface of one or more lower teeth [2].

The prevalence of posterior crossbites in the primary dentition can vary from 20,4% to 3,1%, and can raise from respiratory problems, non-nutritive sucking habits, and functional occlusal changes [3]; in the anterior region, the prevalence of crossbites in young children varies from 0 to 26%, depending on the population studied; this last condition is much more prevalent in Asian populations due to genetic heritage [2].

This malocclusion releases the protrusive movement of the mandible, which finishes its growth around age 21, and reduces the anterior growth stimulus of the maxilla caused by interincisal contact, potentially leading to temporomandibular joint dysfunction [4].

This malocclusion, untreated, can cause significant variations in the growth vector, altering the architecture of the middle and lower thirds of the facial skeleton during growth and development [5]. A simple premature contact in the primary dentition can develop into a functional malocclusion, leading to dental or dento-skeletal changes that affect orofacial functions such as chewing, speech, and swallowing, in addition to causing or worsening psychological problems related to dentofacial aesthetics, especially in females during childhood and adolescence [4,6].

As soon as a crossbite is identified in early childhood, it should be treated using minimally invasive, simple techniques that require little chair time and do not require child cooperation [4,7,8].

Although there is no consensus in the literature regarding the best method for treating anterior crossbites in early childhood [7], Neuro-occlusal rehabilitation therapy has tools capable of treating this dento-occlusal condition at this stage of childhood development, Direct dental tracks and Planas' dental tracks [8]. This functional orthopedic treatment philosophy is applied to primary teeth. It is based on correcting muscle and masticatory dynamics, changing the mandibular posture with selective wear, when there are

premature occlusal contacts, and bonding resin composites, in the regions where the crossbite occurs, producing a new occlusal plane [8,9].

These composite built-ups prevent the mandible from returning to its habitual posture. They change the mandibular position and stimulate a balanced growth and development of the muscles and bones of the stomatognathic system, guiding the patient back to his individual normal [8,9].

Direct dental tracks and Planas dental tracks are treatment options that do not depend on patient cooperation. They are low-cost procedures that can even be done in the public services [6,9].

OBJECTIVE

This case report presents the surveillance of a 4-year-old female preschooler, presenting anterior and posterior crossbite, midline deviation, and second molars presenting mesial step terminal relationship that was treated using Direct dental tracks.

MATERIAL AND METHODS

This treatment was approved by the Ethics Committee of Nove de Julho University, number 1.358.738. The treatment was conducted at Nove de Julho University Dental Clinic, in the "Specialization Course of Orthodontics".

Parents signed an informed consent for this treatment.

CASE REPORT

Dental history

The patient, C. M. R., 4 years old, female, attended the Orthodontics clinic at Nove de Julho University, brought by her mother, who complained that "her daughter had a bad bite".

Anamnesis

Clinical examination revealed the need for orthodontic treatment due to the presence of anterior and posterior crossbites; moreover, her occlusion presented a second primary molars relationship "in mesial step", presence of upper and lower primate

spaces, and a mixed Baume arch, without upper interincisal diastemas and with lower diastemas and negative overjet [10] (Figs. 1-4).

Fig 1. Initial photo, right lateral view.
Fig 2. Initial photo, left lateral view.
Fig 3. Initial photo in occlusion.

Fig 4. Initial photos, front, profile, and smile.

Clinical history

In this first appointment (December, 2019), upper and lower impressions were taken, and panoramic radiographs were requested.

In the second appointment, after evaluating the X-ray and the plaster models, the proposed treatment was firstly the placement of Direct dental tracks on the posterior upper teeth (55 or A, 54 or B, 64 or I, 65 or J) and later Direct dental tracks on the upper lateral incisor (62 or G) and on the upper canines (53 or C, 63 or H).

Facial measurements were taken to determine the new vertical dimension and the height of the composite. This facial balance is calculated by the difference between the average measures taken from the canthus (corner of the eye) to the labial commissure of each side, minus the measure of the existing facial height, taken from the subnasal point (just below the nose) to the soft chin. (Figures 5 and 6).

Figure 5 – Measurement from the subnasal to the soft chin.

Figure 6 – Measurement from the labial commissure to the canthus.

In the third appointment (February, 2020), after dental prophylaxis, relative isolation with cotton rolls, enamel conditioning with 37% phosphoric acid, and application of 3M Single Bond dentin adhesive, then Direct dental tracks were directly placed over deciduous teeth with 3M Z250 composite resin, shade A1, and polymerized with a blue LED light-curing unit, until the facial balance was restored, but no composite increments thicker than 2mm can be placed in a single appointment. After dental tracks curing, the composite excesses were removed with a tapered diamond bur mounted on a high-speed handpiece, then occlusal contacts were adjusted using 200-micron Bausch carbon paper, and a diamond wheel-shaped bur mounted on a high-speed handpiece. Soft-lex sanding discs were used in a low-speed handpiece for final adjustments and polishing.

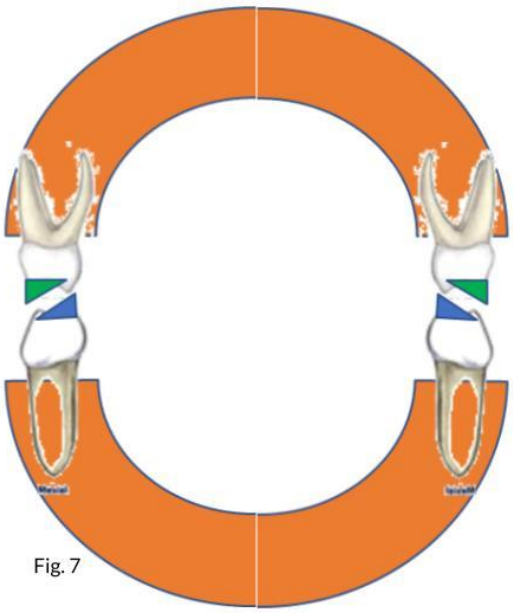

Figure 7 – Planas' Dental tracks, the upper tracks with palatal-to-buccal inclination and lower tracks with buccal-to-lingual inclination, this case was treated using Direct dental tracks that were placed just on the upper arch following Planas' principles..

The result of this third appointment and first clinical treatment consultation was an initial bite lift, with anterior teeth disocclusion. (Figures 7,8,9)

Figure 8. Frontal view after Direct dental tracks placement.

Figure 9. Lateral view after Direct dental tracks placement.

In the following appointment, 1 month later, the tracks were adjusted using 200 micron Bausch carbon contact paper and a diamond wheel-shaped bur on a high-speed handpiece to correct midline deviation. After that, using the same dental composite, Direct dental tracks were installed on the upper canines (53 or C and 63 or H) following the inclination of the previously installed tracks (approximately 45°). (Figures 10-13).

Figure 10. Direct dental track on tooth 53 or C

Figure 11. Direct dental track on tooth 63 or H.

Figure 12. Frontal view of direct dental tracks.

Figure 13. Occlusal view of direct dental tracks.

The patient was supervised monthly for 6 months. In November 2020, after realizing that tooth 62 or G was more lingualized than the remaining teeth (Figure 13), a new Direct dental track was installed on that tooth (Figure 14).

Figure 14. Direct dental track on tooth 62 or G

Twelve months (1 year) after the treatment began, the patient developed into the mixed dentition phase, with her lower permanent incisors erupting against the palatal surface of the upper incisors, showing the effectiveness of the treatment with the maintenance of the overject produced by the Direct dental tracks and the Direct dental tracks(Figures 15-17).

Figure 15. Control (12 months) right lateral view.

Figure 16. Control (12 months) left lateral view.

Figure 17. Control (12 months) frontal lateral view.

After 18 months (1.5 years) of the Direct dental tracks, it was possible to observe the permanent lower central incisors fully erupted and the corrected midline, indicating treatment stability. (Figures 18-20).

Figure 18. Control (18 months) frontal view.

Figure 19. Control (18 months) right lateral view.

Figure 20. Control (18 months) left lateral view.

After 30 months (2.5 years), the lower lateral incisors were erupting, and the upper lateral incisors had exfoliated, in addition to the erupting first molars. (Figures 21-25).

Figure 21. Control (30 months) right lateral view.

Figure 22. Control (30 months) left lateral view.

Figure 23. Control (30 months) frontal view.

Figure 24. Control (30 months) upper occlusal view.

Figure 25. Control (30 months) lower occlusal view.

Thirty-six months (3 years) after treatment had started, the first permanent molars were in "Class I" occlusion. At that moment, new X-rays and plaster models were requested to plan the second stage of treatment (occlusion development supervision) using Planas orthopedic devices until the final occlusion is established [11] (Figs. 26-27).

Figure 26. Control (36 months) lateral smile view.

Figure 27. Control (36 months) frontal view.

DISCUSSION

Direct dental tracks are dental composites, added to the occlusal surfaces of the posterior teeth, and to the incisal edges of the anterior teeth, that change the mandible position and the occlusal plane, modifying the shape of the craniofacial skeleton and returning the patient to the normal individual growth path [8,11].

Crossbites can interfere with the normal growth of the maxilla [12,13]. In the first consultation, it was possible to notice that the patient presented a straight facial profile, unusual for a preschool child, since during this growth phase, we should observe the maxilla advancing anteriorly more than the mandible, producing a convex profile with a slight overject. This facial straight profile is the result of maxillary atresia, caused by the lack of anterior growth stimulus, provided by the contact of the vestibular faces of the lower incisors with the palatal faces of the upper incisors. In addition, we noted a slight deviation of the midline to the left, due to the displacement of the mandible caused by the crossbite.

The tongue is a functional Moss matrix capable of stimulating the growth of its adjacent structures when performing its functions in the oral cavity, like phonation and swallowing, and at rest [14,15]. In this case, the molars presented an edge-to-edge occlusal relationship, indicating the lack of maxillary tongue stimulation, caused by a lower tongue resting posture in the oral cavity. This altered function worsens the patient's skeletal discrepancies, as it keeps stimulating mandibular growth, while failing to stimulate maxillary growth.

As the patient is a preschool child, doubts arose regarding her cooperation in the use of removable devices; therefore, we opted for a treatment using dental tracks, as proposed by Pedro Planas, which do not need patient collaboration [8,9,11].

These dental tracks aim to remove occlusal and physiological interferences and redirect craniofacial growth, reprogramming the patient's musculature [8,9,11,16]. Direct dental tracks were installed on the occlusal surface of the upper posterior teeth, correcting the facial height proportionally to the average of the canthus-labial commissure measurements.

This correction increased the lower facial height, preventing premature occlusal contacts, releasing mandibular lateral movements, and balancing the masticatory muscles [17], satisfactorily stimulating maxillomandibular transverse growth during the period in which the patient was evaluated. That could be noticed as the first permanent molars erupted in a "Class I" normal position (palatal cusps of the upper molars occluding in the central groove of the lower molars and buccal cusps of the lower molars occluding in the central groove of the upper molars). Direct dental tracks were installed on the upper canines and on the upper lateral incisor on the right side, correcting the midline; these dental tracks redirected the anterior growth vector to the maxilla and reduced the anterior growth of the mandible, leading to a normal interincisal overjet as the permanent teeth erupted.

After 3 years of treatment, her dental development respected the eruption chronology, which confirms that the child received occlusal stimuli at the right age, and that these stimuli balanced her facial architecture, returning it to her normal individual growth path [8].

Although there is no consensus indicating the best treatment option for anterior crossbite in the primary dentition, and despite the low level of evidence [7], there is a consensus on the best time to start treatment, which should begin as soon as the problem is detected [8].

In this case, we started her treatment when the patient was 4 years old. At this age, in some cases, we do not have good acceptance and cooperation from the patient and family when we opt for a treatment with removable or fixed appliances, as the child may have difficulty cooperating, but the patient and her parents collaborated very well with the treatment, attending to all the dental appointments.

The use of Direct dental tracks has proven effectiveness in changing the mandibular posture, correcting the crossbite, and restoring the functional performance of the stomatognathic system.

These devices repositioned the condyles in the articular cavity, and as the patient was in her growth period, they remodelled these skeletal structures; moreover, ligaments and articular spaces accommodated and modified themselves to the new position of the growing condyle.

FINAL CONSIDERATIONS

The treatment of a malocclusion using Direct dental tracks does not depend on patient cooperation, other than during chair time, which occurs in progressive sessions until the desired result is obtained. Furthermore, it is a low-cost procedure that can even be used by patients in the public health system. This is not a final procedure, but a malocclusion interceptive care, returning patients to their normal individual growth path, and preparing the upper and lower dental arches to receive the permanent teeth and relate harmoniously in the facial balance.

This case was satisfactorily treated with Direct dental tracks and will be supervised every six months during her mixed and permanent dentition, until the patient completes her skeletal growth.

AUTHORS DISCLOSURE

All the authors disclose financial interests.

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We would like to acknowledge the parents who brought this patient for treatment and gave consent to this publication.

WORK MANAGEMENT

This preschool child was treated by Profa. Dra. Ana Carolina Costa da Mota Ciarcia, a student of the Specialization course of Orthodontics of Universidade Nove de Julho - UNINOVE, and these records were presented in her final course essay, as a requirement to obtain her Orthodontics degree in Brazil; Dr. Maria Priscila Pugliese helped organizing data during this treatment, Professor Olga Maria Altavista supervised all this treatment, Professor Silvia Olivan is a Professor of the Orthodontics Specialization Course and also supervised the case, and Professor Marcos Fernando Xisto Braga Cavalcanti is a Clinical Professor of the Child Clinic of of Nove de Julho University - UNINOVE, and transformed all the records into this article, PhD. Francesca Diomede revised the manuscript and suggested corrections.

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