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ORIGINAL

Occlusal changes in primary dentition after treatment of dental interferences

Cambios oclusales en dentición temporal después del tratamiento de interferencias dentarias

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ABSTRACT

Introduction: the treatment of malocclusions at an early age consists of selective carving that provides the child with a real possibility of adequate growth of the craniofacial complex.
Objective: to identify the occlusal characteristics in anteroposterior, transverse and vertical sense before and after treatment of occlusal interferences in children with posterior functional unilateral crossbite.
Method: a longitudinal study was carried out with a panel design; The universe was made up of 632 children aged 3-5 years from the area belonging to the "Juan Manuel Páez Inchausti" polyclinic of the Isla de la Juventud municipality; The sampling was non-probabilistic, intentional, consisting of 20 patients with posterior functional unilateral crossbite, who underwent treatment for occlusal interferences. The data were presented in statistical tables and summarized in averages, standard deviation and percentages for better understanding.
Results: significant reductions occurred in all treated patients, with a significant reduction ($p<0,05$) in overjet and overshoot of 0,7 and 1,0 mm respectively. The lower midline deviation was significantly corrected by an average of 2,2 mm ($p<0,05$). Significant increases in maxillary transverse dimensions were achieved at the end of treatment.
Conclusions: the timely application of this method constitutes the ideal way to intercept dental malocclusions and prevent future dentomaxillofacial anomalies, as well as alterations of the temporomandibular joint.

Keywords: Occlusal Interferences; Selective Carving; Temporary Dentition.

RESUMEN

Introducción: el tratamiento de las maloclusiones en edades tempranas consiste en el tallado selectivo que proporciona al niño una posibilidad real de crecimiento adecuado del complejo craneofacial.
Objetivo: identificar las características oclusales en sentido anteroposterior, transversal y vertical antes y después del tratamiento de interferencias oclusales en niños con mordida cruzada unilateral funcional posterior.
Método: se realizó un estudio longitudinal con un diseño tipo panel; el universo estuvo constituido por 632 niños de 3-5 años de edad del área perteneciente al policlínico "Juan Manuel Páez Inchausti" del municipio Isla de la Juventud; el muestreo fue no probabilístico, intencional, quedando conformado por 20 pacientes con mordida cruzada unilateral funcional posterior, a los cuales se les realizó tratamiento de las interferencias oclusales. Los datos se presentaron en tablas estadísticas y se resumieron en promedios, desviación estándar y porcentajes para mejor comprensión.
Resultados: en todos los pacientes tratados se produjeron reducciones significativas, con reducción significativa ($p<0,05$) del resalte y el sobrepase de 0,7 y 1,0 mm respectivamente. La desviación de la línea media inferior se corrigió significativamente en un promedio de 2,2 mm ($p<0,05$). Se lograron aumentos significativos de las dimensiones transversales maxilares al final del tratamiento.
Conclusiones: la aplicación oportuna de este método constituye la vía ideal para la intercepción de maloclusiones dentarias y la prevención de futuras anomalías dentomaxilofaciales, así como alteraciones de la articulación temporomandibular.

Palabras clave: Interferencias Oclusales; Tallado Selectivo; Dentición Temporal.

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INTRODUCTION

The most dynamic phenomenon observed in the oral cavity is dental occlusion. The characteristics of occlusion during primary dentition are precursors of occlusion in permanent dentition, hence the importance of achieving functional and stable occlusion as early as possible.[1,2]

From birth, the paratype stimuli that produce a developmental response in the face are nasal breathing, breastfeeding, abrasion and wear of the perfect balance of the primary dentition, and the eruption of the permanent incisors and first molars.[3,4,5,6,7]

Breastfeeding prepares the child's muscles to eat hard and dry foods as soon as their primary teeth erupt. When breastfeeding has not been adequate, and the child continues to feed on liquids and purees, the masticatory apparatus does not fulfill its function and, therefore, does not develop properly.[8,9,10]

Tooth attrition is physiological and, therefore, conditioned by the use of the teeth. It is selective and follows a sequence throughout life, depending on diet, type of occlusion, and age.[11] It is common to find underdeveloped mouths that lack incisal contact and free lateral movement.

This is due to the temporary canines not being worn down due to lack of function, which causes interference that prevents proper chewing, abrasion of the occlusal surfaces, and the establishment of a balanced occlusal plane.[3,6,11,12,13]

Selective wear is considered a preventive therapy, although it can be used to correct existing malocclusion, especially when it is functional.[3,14]

The early elimination of occlusal interferences, complemented by masticatory guidance and care of the vertical dimension, undoubtedly improves the conditions for achieving mixed and permanent dentition, thus avoiding temporomandibular joint dysfunction and significant skeletal alterations that require future orthodontic or even more complex orthopedic treatment.[3,6,11,12,13,14,15,16]

Considering the above, the following scientific problem was formulated: What occlusal characteristics in the anteroposterior, transverse, and vertical directions will children with posterior unilateral functional crossbite present before and after treatment with selective wear?

Therefore, the objective was to identify the occlusal characteristics in the anteroposterior, transverse, and vertical planes before and after treatment of occlusal interferences in children with posterior unilateral functional crossbite.

METHOD

A longitudinal study with a panel design was conducted on children aged 3 to 5 with posterior unilateral functional crossbite who belonged to the "Juan Manuel Páez Inchausti" polyclinic in the municipality of Isla de la Juventud from June 2022 to June 2023.

Universe and sample

The universe consisted of 632 children aged 3-5 years from the area belonging to the "Juan Manuel Páez Inchausti" polyclinic who were examined. 29 of whom presented occlusal interferences and lateral deviation of the mandible, which caused posterior unilateral functional crossbite. The exclusion criterion was a lack of cooperation in carrying out the treatment.

Techniques and procedures

After obtaining informed consent from the legal guardians, each patient underwent study models and a physical functional examination to determine occlusal interferences and a data collection form was completed.

The occlusal adjustment or selective wear method used in this study was that of Dr. Pedro Planas,[17] which required air rotor diamond burs with a diameter of 4,5 mm, a thickness of 1,5 mm, and a shaft length of 20 mm. The treatment was completed with vertical dimension care, always grinding on non-functional cusps to maintain this dimension. Regarding the midline exercises, the patient was instructed to stand in front of a mirror and perform three sets of 40 to 50 repetitions of mouth opening and closing, centering the midlines 3 times a day.

Regarding masticatory orientation, the patient was instructed to chew hard and dry foods on the non-crossed side. Parents, mainly during mealtimes, should reinforce this instruction.

Patients were scheduled for monthly appointments to check their progress and determine the time required to uncross the bite in each case.

Occlusal characteristics were measured at two points in time: before occlusal interference treatment and after treatment was completed.

Techniques for processing and analyzing results

All the information was entered into an Excel database, processed automatically using the SPSS 13,0 statistical package, and summarized in averages and percentages, which were then summarized in statistical tables for better interpretation of the results.

To evaluate the effectiveness of this method, the mean or percentage comparison test was used, as appropriate for non-independent and paired samples, with a significance level of $p<0,05$.

RESULTS

Of a total of 632 children examined in the Orthodontics department, 29 children (4,6 %) presented with posterior unilateral functional crossbite (figure 1).

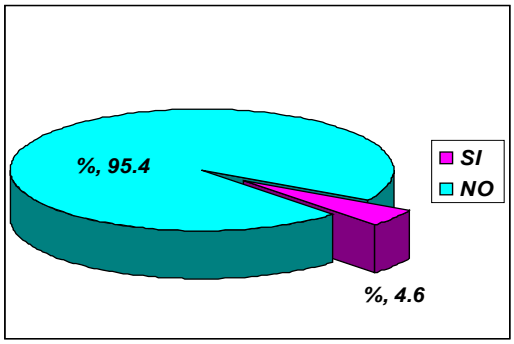

Figure 1. Children examined according to the severity of occlusal interference. Juan Manuel Páez Inchausti Polyclinic. June 2022–2023

Before starting treatment with selective wear, patients presented an average overhang of 1,5 mm, an overrun of 1,4 mm, and a deviation of the lower midline of 2,2 mm. After treatment, there was a significant reduction ($p<0,05$) in overhang and overrun of 0,7 mm and 1,0 mm, respectively. The lower midline deviation was significantly corrected by an average of 2,2 mm ($p<0,05$) (table 1).

Table 1. Average values (X) and standard deviation (SD) of the highlight, overshoot, and deviation from the lower midline before and after treatment

Values (mm)	Before		After		Average variation
	X	DE	X	DE	
Highlight	1,5	1,0	0,8	0,8	-0,7 *
Overtake	1,4	1,1	0,4	0,6	-1,0 *
Lower Middle Line	Lower Middle Line	0,7	0,0	0,2	2,2 *

Note: *p<0,05

All patients began treatment with an average transverse width from canine to lower canine of 18,6 mm and showed a non-significant increase of 0,3 mm in this average after treatment ($p>0,05$). Among the upper canines, the average value at the start of treatment was 21,2 mm, and at the end of treatment, a non-significant increase of 0,8 mm was observed ($p>0,05$). Something similar occurred for the transverse widths from molar to molar in both the lower and upper jaws. In the beginning, they showed average values of 26,8 mm for the lower teeth and 27,9 mm for the upper teeth, with non-significant increases in these averages of 0,4 and 0,6 mm, respectively ($p>0,05$) (table 2).

Table 2. Average and standard deviation of transverse widths between lower and upper canines and lower and upper second molars before and after treatment

Transverse widths	Before		After		Average variation
	X	DE	X	DE	
C-C i	18,6	1,6	18,9	1,6	0,3 *
C-Cs	21,2	2,0	22	2,3	0,8 *
M-Mi	26,8	1,9	27,2	1,9	0,4 *
M-Ms	27,9	2,4	28,5	2,3	0,6 *

All patients in the study presented a dissolution canine ratio of ¼ in 65,0 % and ½ unit in 35,0 % on the cross side at the start of treatment. With the correction of the unilateral functional posterior crossbite, there was a significant reduction in this proportion by 30,0 % and 35,0 %, respectively, so that no child showed a ½ unit distocclusion at the end of treatment. In comparison, there was a significant increase ($p<0,05$) in the frequency of children with neutral occlusion of 65,0 % (table 3).

Table 3. Distribution of children according to the relationship of canines on the crossed side before and after treatment

Canine relationship	Before		After		Average variation
	No.	%	No.	%	
Neutroclusión	0	0,0	13	65,0	65,0 *
Distoclusión 1/2	7	35,0	0	0,0	-35,0 *
Distoclusión 1/4	13	65,0	7	35,0	-30,0 *
Total	20	100,0	20	100,0	-

Regarding the relationship of the second primary molars on the crossbite side, initially, a straight terminal plane relationship was more common in 55 % of cases, a proportion that decreased by only 5 % with treatment, followed by a distal step relationship in 25,0 %, which varied significantly so that at the end of wear no child maintained this relationship. The mesial step was present in 20,0 % of children at the start of treatment, and at the end, a significant increase in this variable was observed in 30 % (p<0,05) (table 4)

Table 4. Distribution of children according to molar relationship on the cross side before and after treatment

List of E/E	Before		After		Percentage change
	No.	%	No.	%	No.
Straight terminal plane	11	55,0	10	Straight terminal plane	11
Mesial step	4	20,0	10	Mesial step	4
Distal step	5	25,0	0	Distal step	5
Total	20	100,0	20	Total	20

DISCUSSION

The results obtained in this study differ from those reported by Sánchez-Torres et al.[18], who reported 9,14 % of children in primary dentition with unilateral posterior crossbite; these authors also cite the values found by Tschill (16,0 %) and Carvalho (10,0 %). However, they were very similar to those found by Farsi (4,0 %).[18]

Bishara[19] cites Vadiakas when he mentions that posterior crossbites are relatively common in this dentition, with incidences ranging from 4 to 27 %.

The present study shows similar results to those obtained by Arias-Araluce,[20] which reflects a correction of the lower midline of 1,75 mm; unlike the overjet and overbite, which show a non-significant reduction, so they do not correspond in this aspect, since in the present study, there was a significant reduction in the overjet and overbite, which was very favorable considering that in the deciduous dentition the incisors are almost perpendicular to the occlusal plane, with a slight overbite or an edge-to-edge relationship.

By eliminating dental interference, the centric occlusion position was restored; thus, the patient, who until then had been limited to opening and closing movements, could unlock the jaw, creating the necessary conditions for functional stimulation of the stomatognathic system.

The slight increase in the transverse dimensions of the dental arches confirms that this treatment promotes transverse growth of the jaws and offers more advantageous conditions for achieving a better jaw position. These results are consistent with other published studies. [20,21,22,23,24,25,26,27]

With treatment, most children achieved neutral canine occlusion, "a necessary condition for establishing proper canine function";[1,16] in a few patients, slight distocclusion persisted, which will evolve toward neutral occlusion with growth and progressive settling of the occlusion, leading to interference-free masticatory function.

In a similar study,[20] a predominance of distocclusion of the canines was observed at the start of treatment, followed by neutral occlusion on the opposite side. After treatment, 75,0 % of cases evolved favorably toward neutral occlusion, and only 16,7 % persisted with distocclusion, which is unfavorable for establishing adequate occlusion.

The study above showed a straight terminal plane relationship predominance at the start of treatment, followed in descending order by mesial and distal steps. After treatment with selective wear, a slight increase in the straight terminal plane and mesial step relationships was observed, while the distal step relationship was reduced.[20] This coincides with the results of the present study.

In general, the terminal plane (E-E) and mesial step ratios were increased on both sides; these patterns are considered "normal" and should remain unchanged until the change of dentition occurs to ensure the eruption of the permanent incisors with less overbite and of the first permanent molars in a firm neutral occlusion. According to Moyers,[16] the elimination of occlusal interferences facilitates the development of normal relationships between the first permanent molars; this treatment should be considered a system that guides the development of the primary dentition.

CONCLUSIONS

The initial averages of overjet and overbite decreased significantly after treatment with selective wear. Transverse dimensions increased slightly with treatment. Most of the treated children corrected the lower midline. Favorable canine and molar relationships were achieved in most of the treated children. The timely application of this method is the ideal way to intercept dental malocclusions and prevent future dental anomalies and temporomandibular joint disorders.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest..

AUTHORSHIP CONTRIBUTION

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Writing – original draft: Yaima Pupo-Martínez.
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