

Impact of Wearing Palatal Expanders on the Quality of Life of Children Aged 8 to 10 Years

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ABSTRACT

Objective: To assess the impact of wearing palatal expanders on the oral health-related quality of life (OHRQoL) of children aged 8 to 10 years. **Material and Methods:** The sample consisted of 35 children aged 8 to 10 years treated at the orthodontics and pediatric dentistry outpatient clinics affiliated with the Dental School. Children were divided in two groups: 17 were submitted to palatal expansion treatment (Group 1), while 18 just received coronal polishing and topical fluoride application (Group 2). The Brazilian version of the Child Perceptions Questionnaire (CPQ₈₋₁₀) was used to assess children's OHRQoL. The questionnaire was administered before the expander was placed, at the end of its activation, and before its removal. Intervals between the interviews were similar in the two groups. Descriptive statistics and ANOVA were used for data analyses. **Results:** The overall CPQ₈₋₁₀ score was not significantly different between the groups. The results show statistically significant differences between the two groups only for the functional limitations domain after activation of the appliance ($p=0.001$). **Conclusion:** Palatal expanders may negatively affect children's functions only during the initial wearing period.

Keywords: Orthodontics; Malocclusion; Palatal Expansion Technique; Quality of Life.

Introduction

For some years, quality of life has received a lot of attention from several health areas. In dentistry, many research studies have associated oral health and its impact on quality of life in different age groups [1-3], including children and adolescents [4-8]. More recently, attention has turned to the impact of dental procedures, such as the impact of wearing orthodontic appliances on people's quality of life [9-12]. Assessments of clinical status before and after orthodontic treatment have often been based on conventional clinical assessments, such as cephalometry and occlusal characteristics. Evidently, clinical criteria play an important role; however, functional and social impacts have become as important as clinical parameters [13].

Palatal expanders are certainly widely used in orthodontic clinical practice, especially in children, as their goals are easily achieved among these patients [14]; beyond this, early treatment provided increased intermolar width [15]. Nevertheless, studies on the impact of wearing palatal expanders on these patients' quality of life are scarce.

The Child Perceptions Questionnaire (CPQ) includes questions about oral symptoms, functional limitations, emotional well-being, and social well-being. Originally devised in Canada, The CPQ₈₋₁₀ is an instrument that measures oral health related to quality of life and is designed exclusively for children from 8 to 10 years. The CPQ₈₋₁₀ was translated and validated for use in Brazil, proving valid and reliable [16].

There is a lack of studies conducted with children with mixed dentition and under interceptive orthodontic treatment, particularly palatal expanders. The aim of the present study was to assess the negative impact of wearing palatal expanders on the quality of life of children aged 8 to 10 years.

Material and Methods

Sample

Thirty-five male and female children aged 8 to 10 years treated at the orthodontics and pediatric dentistry outpatient clinics affiliated with Dentistry Faculty participated in this study. Of these patients, 17 were submitted to palatal expansion (Group 1) and 18 children served as a comparison (Group 2). Group 2 was not paired with group 1. The children in group 2 were being treated at the orthodontics and pediatric dentistry outpatient clinics and were not submitted to any clinical intervention, except for coronal polishing and topical fluoride application.

The sample power test was performed by the OpenEpi software [17], with a 95% confidence interval, 80% test power, exposed control percentage of 40% and percentage of exposed cases of 90% totaling a sample of 30 children.

The inclusion criteria were age between 8 and 10 years and indication for palatal expansion with Haas, butterfly palatal expander or Hyrax appliances. In group 2, the children had to be 8 to 10 years old and were excluded if they had any caries lesions in their anterior or posterior teeth or tooth fractures and if they were wearing any fixed or removable orthodontic appliance. Children from group 2 were not evaluated regarding occlusion. Patients with craniofacial syndromes or anomalies reported by their parents were also excluded from the study.

Clinical Procedures

In group 1, in which patients were treated with palatal expanders, aspects related to wearing of appliances were explained to the children and their parents/legal guardians. Besides guidance on the form of activation (two activations per day during two weeks), information about hygiene and feeding was provided.

Possible discomfort while wearing the appliances was not provided to avoid bias. Before the installation of the appliance, children from group 1 were submitted for coronal polishing and topical fluoride application as well as the group 2. All steps (instructions, prophylaxis and installation of the appliance) were performed by a single examiner.

Data Collection

The data related to quality of life was collected using the Brazilian version of the CPQ₈₋₁₀ [16]. This questionnaire contains 25 items subdivided into four domains: oral symptoms (5 items), functional limitations (5 items), emotional well-being (5 items), and social well-being (10 items) [18]. The items address the frequency at which events occurred 4 weeks prior to the questionnaire application. A 5-point scale was used, with the following response options: “Never” = 0; “Once or twice” = 1; “Sometimes” = 2; “Often” = 3, and “Everyday or almost everyday” = 4. The CPQ₈₋₁₀ score is calculated by summing all points for each item. Thus, the overall score ranges from 0 (no negative impact on quality of life) to 100 (maximum negative impact on quality of life).

The questionnaire was administered in three different periods by a single examiner. In group 1, the interviews were conducted before cementation of the palatal expander (T1), at the end of its activation (after opening of the expansion screw) (T2), and before its removal (T3). In group 2, the interviews observed the same time intervals between T1 and T2 (1 month after T1) and between T2 and T3 (4 to 6 months), which seem to be enough to avoid relapse or to guarantee minimal changes in a short-term follow-up [19] (Figure 1).

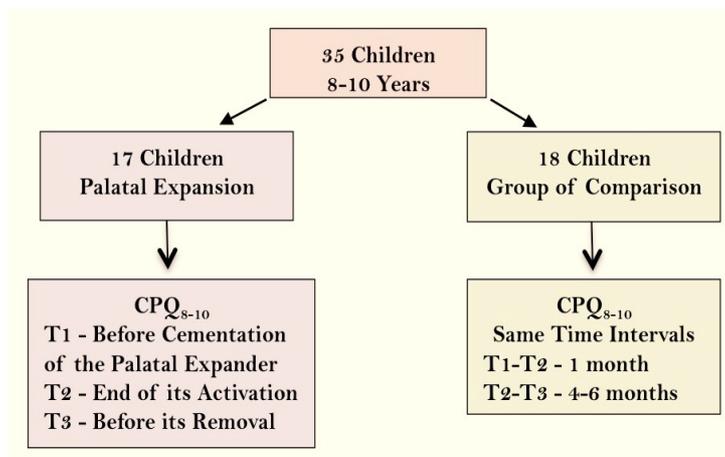


Figure 1. Methodology flowchart.

The questionnaire was administered as an interview as some previous studies had concluded that 8-year-olds have difficulty completing the questionnaire on their own [20] and the scores of the subscales and overall score on the CPQ₈₋₁₀ were significantly higher in the group of children who responded to the interviewer-administered measure, not compromising the results [21].

Data Analysis

The SPSS (version 22.0, SPSS Inc., Chicago, IL, USA) was used for data analysis. Descriptive statistics was performed using the mean values and standard deviation of the overall score and subscales. The Shapiro-Wilk test was utilized to test for normality of the data, and parametric ANOVA was used for analyzing the results and compare the two groups in the three moments of treatment of group 1. The

significance level was set as $p < 0.05$. All the essential points to describe an observational study (STROBE) has been followed.

Ethical Clearance

This study was approved by the Human Research Ethics Committee (Protocol no. 0465.0.203.000-09). An informed consent form was signed by the legal guardians and an assent form was signed by children. Only those children who signed the assent form and whose parents did so as well were included in the study.

Results

The sample consisted of 35 children, most of whom were female (60.0%). The age distribution was as follows: 34.3% (8 years), 45.7% (9 years) and 20.0% (10 years). Among those children submitted to palatal expansion, Hyrax, Haas, and butterfly palatal expanders were worn by 70.6%, 17.6%, and 11.8%, respectively.

Table 1 shows the maximum and minimum values for all domains related to each group's quality of life in all periods assessed.

Table 1. Minimum and maximum values for all domains related to quality of life.

Domains	Group 1 (Expander)			Group 2			CPQ ₈₋₁₀ Min. Max
	T1	T2	T3	T1	T2	T3	
	Min.-Max.	Min.-Max.	Min.-Max.	Min.-Max.	Min.-Max.	Min.-Max.	
Oral Symptoms	0-11	1-8	1-10	0-16	0-10	0-9	0-20
Functional Limitations	0-4	0-12	0-5	0-8	0-6	0-6	0-20
Emotional Well-being	0-11	0-12	0-6	0-15	0-9	0-12	0-20
Social Well-being	0-15	0-8	0-6	0-10	0-7	0-5	0-40
Overall Score	0-34	2-27	3-21	0-37	0-25	0-27	0-100

There was a statistically significant difference between the groups in the functional limitation domain at T2 ($p < 0.05$).

Table 2. Means, standard deviation, and p-values were calculated for T1, T2, and T3 for both groups.

Domains	Group 1 (Expander)			Group 2			p-value*		
	T1	T2	T3	T1	T2	T3	T1	T2	T3
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)			
Oral Symptoms	4.59 (3.26)	4.53 (2.12)	4.65 (2.15)	5.06 (4.26)	3.72 (2.76)	3.94 (2.62)	0.719	0.342	0.394
Functional Limitations	1.53 (1.33)	4.18 (3.20)	2.29 (1.65)	2.11 (2.59)	1.06 (1.70)	1.78 (1.99)	0.413	0.001	0.410
Emotional Well-being	3.12 (3.24)	2.24 (3.27)	1.65 (2.18)	2.94 (4.28)	2.17 (2.99)	2.28 (3.67)	0.894	0.949	0.544
Social Well-being	2.82 (3.63)	1.82 (2.19)	1.47 (1.97)	2.00 (2.61)	0.72 (1.70)	0.5 (1.29)	0.444	0.105	0.093
Total	12.06 (8.09)	12.71 (7.88)	10.06 (5.30)	11.83 (11.55)	7.67 (6.80)	8.56 (7.57)	0.947	0.051	0.504

*Shapiro-Wilk test and parametric ANOVA.

Discussion

The posterior crossbite is defined when the abnormal, vestibular or lingual relationship of one or more maxillary teeth, with one or more mandibular teeth, when the dental arches are in centric relation [22]. Several treatments have been recommended to correct this problem.

Oral health-related quality of life is a multidimensional concept that refers to how severely oral disorders can affect the normal functions of an individual. The CPQ₈₋₁₀ was originally designed to assess the

impact of oral disorders, such as dental caries and cleft lip/palate, on quality of life [18]. Since wearing orthodontic appliances can cause physical and social discomfort, it is assumed that CPQ can measure the impact of wearing orthodontic devices on the OHRQoL of children and adolescents [10,11].

Previous studies pointed to a larger negative impact on OHRQoL among children aged 8 to 10 years with malocclusion, especially of anterior teeth than among children without malocclusion [4,23,24]. A study used the CPQ₈₋₁₀ to compare Oral health-related quality of life (OHRQoL) among 9-year-old children with unilateral posterior crossbite and children with normal occlusion. No difference between the groups was found [22]. Probably because the crossbite locates in the posterior region, not compromising esthetics.

Studies involving individuals in other age groups (adolescents and preadolescents) provide evidence that a fixed orthodontic appliance may have a negative impact on OHRQoL [9,20]. However, in the first twelve months of treatment with a fixed appliance, the preadolescents and adolescents had positive alterations in their OHRQoL, mainly in the emotional well-being domain [10,25]. Palatal expanders are fixed appliances widely used by children aged 8 to 10 years.

In the present study, the comparison of oral symptoms between children aged 8 to 10 years submitted to palatal expansion and untreated children revealed no significant differences. This demonstrates that wearing expanders did not cause a toothache or oral pain or led to self-perception of halitosis, as expected, among treated children. As palatal expanders hinder oral hygiene, children who wore them were believed to complain about bad breath more often [26].

A significant difference was observed in CPQ₈₋₁₀ scores in the functional limitation domain between the case and control groups after activation of the palatal expander, indicating that treated children had difficulty in eating and speaking at that stage. Nevertheless, before the removal of the appliance, the difference between the groups turned out to be no significant, which makes us believe that the impact on oral functions (e.g., mastication and speech) occurs mainly at the beginning of treatment when the patient is not used to wearing the expander.

In the social well-being domain, no significant difference was noted between the case and control groups, probably because the expanders assessed herein (Hyrax, Haas, and butterfly-shaped Haas) are fixed intraoral appliances bonded to the posterior teeth, and sometimes to the canine teeth, with the main body of the appliance fitted into the palate. The three appliances do not affect esthetics, as they are barely seen when patients speak or smile.

In mixed dentition (from the ages of 6 to 12 years), children usually experience several changes related to natural processes, such as exfoliation of deciduous teeth, tooth eruption, and diastema due to an unerupted permanent tooth, which affect their quality of life at once [4]. This could explain the fact that no differences were found between the groups in the emotional well-being domain in the present study.

The overall CPQ₈₋₁₀ score was not significantly different between the groups, showing, in general, that palatal expanders do not have a negative impact on the quality of life of children in this age group. This finding reinforces the importance of intervening in the crossbite early. Otherwise, the expander will have to be used in adolescence or early adulthood, when it has a major negative impact on quality of life [27].

This study has as limitation a limited sample. Given the need to test a more representative sample and the palatal expander's importance for preventive and interceptive orthodontics, future studies are needed.

It is paramount that the clinical aspects of the dental procedure and the impact of this procedure on children's general well-being be taken into account by pediatric dentists, orthodontists, and clinical dentists who perform interceptive orthodontics. It is necessary to know the limitations that an orthodontic appliance

can place on children's OHRQoL so that the dentist can inform patients and legal guardians about the problems that may arise during interceptive orthodontic treatment. This study proves that the palatal expander causes discomfort at the beginning of treatment but that this discomfort is irrelevant given the benefits this orthodontic appliance provides for future occlusion of this child.

Conclusion

The major practical contribution of this study to pediatric dentistry and orthodontics concerns the scientific evidence that palatal expanders cause functional limitations in patients aged 8 to 10 years only at the beginning of treatment. Therefore, they are well tolerated by children and do not cause oral symptoms or important social and emotional well-being changes.

Authors' Contributions

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All authors declare that they contributed to critical review of intellectual content and approval of the final version to be published.			

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Conflict of Interest

The authors declare no conflicts of interest.

Data Availability

The data used to support the findings of this study can be made available upon request to the corresponding author.

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