Original Article

Impact of the first eight months of orthodontic treatment with a fixed appliance on the families of adolescent patients

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ABSTRACT

Objective: To evaluate the impact of the first 8 months of orthodontic treatment with a fixed appliance on the families of adolescent patients and to examine the evaluative properties of the Family Impact Scale (FIS).

Materials and Methods: The study involved a sample of 94 parents/caregivers of adolescents undergoing orthodontic treatment with a fixed appliance. The participants were asked to answer the Brazilian version of the FIS before treatment (T1) and 8 months after the bonding of the fixed appliance (T2). Statistical analysis was carried out using the Wilcoxon signed rank test and the Bonferroni correction for the overall score and FIS subscales. Responsiveness of the measure and the minimal clinically important difference (MCID) were also assessed.

Results: Among the 94 participants initially admitted to the present study, two were excluded as a result of treatment dropout and failure to return the second questionnaire. Thus, a sample of 92 parents/caregivers participated (response rate: 97.8%). Among the 92 participants, 70 were the mothers of patients, 16 were fathers, and six were other family members. Statistically significant improvements were found in the overall score ($P < .001$) as well as in both parental activity and parental emotions subscales ($P < .001$). The reductions in scores were associated with effect sizes showing moderate clinically meaningful changes in the overall FIS and in the parental/family activity, parental emotions, and family conflict subscales. The MCID was 2.66 for the overall FIS.

Conclusion: The first 8 months of orthodontic treatment with a fixed appliance had a positive impact on the families of adolescents. (*Angle Orthod.* 2014;84:1074–1078.)

KEY WORDS: Adolescent; Orthodontic treatment; Family; Proxy; Parental report; Quality of life

INTRODUCTION

The concept of oral health–related quality of life (OHRQoL) regards how adverse oral conditions affect quality of life. In the last 20 years, considerable research efforts have focused on the development and validation of OHRQoL assessment tools.[1] These scales and questionnaires address the impact of oral and orofacial conditions on the functional, emotional, and social well-being of children and adolescents aged 6 to 14 years and their families. Such tools incorporate the perceptions of both parents/caregivers and children/adolescents.[2,3] The use of these instruments has shown that conditions affecting oral health, such as malocclusion, have consequences not only with regard to physical and functional domains but also with regard to emotional and social well-being.[4]

OHRQoL measures have also been used in health services research to determine whether therapeutic interventions improve the lives of patients.[5] Orthodontic treatment can have a significant impact on quality of life, especially in the first 6 months of therapy. In the first month after the placement of a fixed appliance, the adolescent patient experiences a poorer OHRQoL in comparison to pretreatment OHRQoL as a result of the combination of pain, inconvenience, disability, and

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psychological discomfort.[6] The interval between 6 and 12 months of orthodontic treatment is also a period of significant change in individuals' OHRQoL. There is still a significant worsening of oral symptoms and functional limitations. However, improvements in the social well-being and overall quality of life are also observed.[7]

It is also important to assess the impact of adverse oral conditions on the families of adolescents. Parental reports of the oral health of their sons and daughters may be influenced by the degree to which the parents are emotionally, financially, and psychologically affected by their children's condition. Studies[5,8] have reported that severe dental caries in children has a negative impact on the quality of life of the families, with far-reaching effects on those who share the home and care for the affected child. Moreover, oral health care interventions should address the needs and concerns of parents/caregivers since they are the main decision makers in terms of their children's dental treatment.[9]

Family support is strongly and consistently associated with positive health outcomes among adolescents.[10] The attitudes and perceptions of family members provide the foundation on which an adolescent builds his or her self-perception of appearance, including dental and facial appearance.[11] Although the impact of orthodontic treatment on the OHRQoL of adolescents is well documented,[12] there is no information concerning its impact on family function.

As the major impact of orthodontic therapy on quality of life occurs in the first months following the placement of a fixed appliance,[13] and in view of the importance of family impact data on the measure of OHRQoL among adolescents,[14] the aim of the present study was to evaluate the impact of the first 8 months of orthodontic treatment with a fixed appliance on the families of adolescent patients and to examine the evaluative properties of the Family Impact Scale (FIS).

MATERIALS AND METHODS

Participants

A sample of parents/caregivers of adolescents registered for orthodontic treatment with a fixed appliance at the Department of Pediatric Dentistry and Orthodontics of the Federal University of Minas Gerais (Brazil) were admitted to this study. Participants needed to be literate and fluent in Brazilian Portuguese. The exclusion criteria were parents or caregivers of adolescents with cognitive disorders, craniofacial anomalies, untreated dental caries, traumatic dental injuries, and poor gingival health.

Ethical approval was obtained from the Human Research Ethics Committee of the university (process 0421.0.203.000-11). Information regarding the study was given to participants in the form of a written letter with further verbal information. All individuals participated voluntarily and signed a statement of informed consent.

The sample size was determined using the Power and Sample Size Calculation program (PS, version 3.0, Nashville, Tenn). Based on a pilot study with 10 participants, a sample size of 84 would be required to provide an 80% statistical power in identifying a significant difference in OHRQoL between baseline (prior to treatment) and 8 months after the bonding of a fixed appliance. The determining variable for sample size calculation was the overall FIS score. Data from the pilot study indicated that the difference in the response of matched pairs had a standard deviation of 6.68, and the true difference in the mean response of matched pairs was 2.07. The type I error probability associated with this test was 0.05. The results of the pilot study revealed no need to modify the methodology. The sample was increased by 10 families ($n = 94$) to compensate for possible losses.

OHRQoL Assessment Tool

The participants answered the questions on the FIS, which was developed in Canada and has been cross-culturally adapted and validated for use on the Brazilian population.[15] The FIS evaluates the impact of a child's oral condition on the family and consists of 14 items divided into four subscales, as follows: parental/family activity (PA: five items), parental emotions (PE: four items), family conflict (FC: four items), and financial burden (FB: one item). Each item has five response options: never = 0; once or twice = 1; sometimes = 2; often = 3; and every day or almost every day = 4. A "don't know" response is also allowed. The FIS score is computed by summing all of the item scores. The overall score ranges from 0 to 56; a higher score denotes a greater degree of the impact of the child's oral condition on the functioning of parents/caregivers and the family as a whole.[14]

Assessments of OHRQoL using the FIS were performed prior to the banding and placement of the fixed appliance (T1) and 8 months after the onset of treatment (T2). The questionnaires were self-administered within a 10-minute time frame.

Adolescents' Orthodontic Treatment Need Assessment

The Dental Aesthetic Index was used for the analysis of normative orthodontic treatment needs.[16] This index provides four outcome possibilities: slight treatment need ($\leq$25), elective treatment (26 to 30), highly desirable treatment (31 to 35), and mandatory treatment ($\geq$36).

Table 1. Adolescents' Demographic Characteristics and Orthodontic Treatment Need

	Number (%)
Gender	
Male	44 (47.8)
Female	48 (52.2)
Age, y	
11	45 (48.9)
12	47 (51.1)
Orthodontic treatment need, score	
Slight treatment need (≤25)	32 (34.8)
Elective treatment (26–30)	28 (30.4)
Highly desirable treatment (31–35)	19 (20.6)
Mandatory treatment (≥36)	13 (14.2)
Total	92 (100)

Statistical Analysis

Data organization and statistical analysis were carried out using the Statistical Package for the Social Sciences (SPSS for Windows, version 17.0, SPSS Inc, Chicago, Ill). Descriptive statistics were performed. The Wilcoxon signed rank test was used to determine the significance of differences in overall FIS scores between T1 and T2. The significance level was set at $P < .05$. The Bonferroni correction was used to compare each of the FIS subscales between T1 and T2, with *P*-values of $<.013$ considered indicative of statistical significance.

Responsiveness of the measure was assessed by analyzing the effect size.[17] Effect-size statistics were calculated by dividing the mean of changes scores by the standard deviation of the pretreatment scores in order to give a dimensionless measure of effect. Effect-size statistics of <0.2 indicate a small clinically meaningful magnitude of change, statistics of 0.2 to 0.7 indicated a moderate change, and statistics >0.7 indicated a large change.[18] To calculate the change in score referent to the minimal clinically important difference (MCID) for the FIS, the standard deviation of the outcome score was multiplied by 0.5.[19]

RESULTS

Among the 94 participants initially admitted to the study, two were excluded as a result of treatment dropout and failure to return the follow-up questionnaire. Thus, 92 parents/caregivers participated in the study (response rate: 97.8%). Mothers accompanied 70 (76.1%) of the adolescents and fathers accompanied 16 (17.4%) of the adolescents. Only six (6.5%) adolescents were taken to the orthodontic appointment by a member of the family other than a parent. Table 1 displays adolescents' demographic characteristics and their frequency of orthodontic treatment needs.

The overall FIS score as well as the PA and PE subscale scores were significantly lower at T2 in comparison to T1 (Table 2). Data on the T1 and T2 overall and subscales mean scores as well as effect size and MCID are presented in Table 3. The reductions in scores were associated with effect sizes showing moderate clinically meaningful changes in the overall FIS and in the PA, PE, and FC subscales. The MCID was 2.66 for the overall FIS. Having determined the value of MCID, the percentage of individuals showing or exceeding this value was then computed. Out of the 92 participants, 42 (45.7%) exceeded the MCID for the FIS overall score.

Table 2. Comparison of Medians and Modes of Subscales and Overall Scores at T1 and T2 Among All Participants[a]

	FIS Range	T1 Median	T1 Mode	T2 Median	T2 Mode	*P* Value
PA	0–20	2.00	0	1.00	0	<.001*
PE	0–16	0.00	0	0.00	0	<.001*
FC	0–16	1.00	0	0.00	0	.036*
FB	0–4	0.00	0	0.00	0	.645*
OL	0–56	4.00	0	2.00	0	<.001**

[a] T1 indicates before placement of fixed appliance; T2, 8 months after placement of fixed appliance; PA, parental activity; PE, parental emotions; FC, family conflicts; FB, financial burden; and OL, overall.
* Bonferroni correction. Significant at the level $P < .013$;
** Wilcoxon signed rank test. Significant at the level $P < .05$.

DISCUSSION

In the present study, mothers accompanied their adolescents to orthodontic appointments in 76.1% of cases. As a result of social changes, mothers currently spend less time with their children and adolescents than in the past, but they remain involved in caring for their children and respond reliably to questions regarding health.[20] Indeed, mothers account for the highest percentage of proxy measures employed in studies on child and adolescent health. As mothers tend to be more involved in child care, it is likely that they are more aware of their children's views regarding OHRQoL than are the fathers.[21,22] Moreover, considerable agreement exists between mothers' and fathers' opinions, suggesting that the views of either parent can be used when considering parental perceptions.[23,24]

The present findings revealed significant improvements in family OHRQoL after 8 months of orthodontic treatment among the adolescents, as demonstrated by the significantly lower overall FIS score as well as by the PA and PE subscale scores at T2. Parents/caregivers believe that the inconveniences of orthodontic treatment with a fixed appliance, such as taking time off work for appointments and the breakage of braces, are small in comparison to the expected benefits of treatment. Parents/caregivers also expect a considerable improvement in the social confidence of their adolescent sons and daughters as a result of

Table 3. Mean and Standard Deviation (SD) Overall and Subscale Scores at T1 and T2 with MCID and Effect Sizes[a]

	T1 Mean	T1 SD	T2 Mean	T2 SD	MCID	Effect Size	Effect-Size Description
PA	3.29	3.28	1.98	2.56	1.28	0.40	Moderate
PE	1.50	2.12	0.85	1.54	0.77	0.30	Moderate
FC	1.62	2.18	1.18	1.81	0.90	0.21	Moderate
FB	0.40	0.81	0.42	0.75	0.37	0.02	Small
OL	6.82	6.85	4.43	5.32	2.66	0.34	Moderate

[a] MCID indicates minimal clinically important difference; T1, before placement of fixed appliance; T2, 8 months after placement of fixed appliance; PA, parental activity; PE, parental emotions; FC, family conflicts; FB, financial burden; and OL, overall.

orthodontic therapy.[25,26] Moreover, parental support and control are the most important constructs of family environment. Evidence strongly suggests that parental support exerts a considerable causal effect on an adolescent's response to treatment. Moderate levels of parental control provide guidance to adolescent behavior by setting limits and providing positive teaching.[27]

No statistically significant differences were found regarding the FC or FB subscales. As mothers and fathers tend to agree on their perceptions of the oral health status of their adolescents, they accept spending large sums of money and time to provide their adolescents with orthodontic treatment. The overall high value placed on treatment suggests that parents greatly value the benefits they believe orthodontic therapy will offer.[25] Moreover, conflicting attitudes between adolescents and family members may be resolved during orthodontic counseling.[28]

Responsiveness is the ability of a measure to detect clinical change when the patient's situation improves or deteriorates.[17] The sensitivity to change should be performed in studies evaluating the same population in different moments. The property to assess responsiveness is not well established in many studies that measured OHRQoL. This is a significant omission, given the increasing tendency of researchers to utilize the OHRQoL measures as outcomes in clinical trials.[29] Based on this, our study evaluated the ability of the FIS to detect change in the families of adolescents undergoing orthodontic treatment. The clinically meaningful changes were moderate. The MCID has been defined as the smallest difference in score in the domain of interest that patients perceive as beneficial and that would mandate, in the absence of troublesome side effects and excessive cost, a change in the patient's management.[30] In most circumstances, the threshold of discrimination for changes in OHRQoL appears to be approximately half of the standard deviation value.[19] The MCID for FIS was previously calculated in a study evaluating changes in family-assessed OHRQoL among young children following dental treatment under general anesthesia. Overall, only about 40% of the participants showed or exceeded the MCID for the FIS.[31]

The present study has limitations that should be addressed. First, it would have been methodologically useful to compare changes in OHRQoL between a treated group and control group. However, the follow-up assessment of an untreated control group raises a number of ethical issues, since orthodontic treatment offers benefits to patients.[5,7,32] A second limitation regards differences in the characteristics of the sample. Although some factors that could affect the outcome were controlled, such as the use of removable appliance, others were not controlled, such as the skill of the orthodontist. The third limitation is the evaluation of OHRQoL during the first 8 months of active orthodontic treatment. Although the improvement in the overall FIS score may serve as an indicator of anticipated final improvement, better evidence would be obtained from the change in the FIS score at the end of treatment.[10]

As the family plays a central role in adolescent health, it is essential in clinical practice to have appropriate communication with parents and caregivers concerning what can be expected from the orthodontic treatment of their adolescent sons and daughters in terms of pain, discomfort, limitations, and inconvenience. This strategy can lead to less disappointment and fewer treatment dropouts, thereby improving the quality of orthodontic care.[33]

Further studies should be carried out to assess the impact of orthodontic treatment on the OHRQoL of families. As in any hospital-based survey, the present findings cannot be extrapolated to other adolescent populations with different demographic and clinical characteristics.[10] Nonetheless, the FIS is a brief assessment tool that can be used in epidemiological surveys and included as a broad indicator in political, research, public health, and clinical actions.[8] Large multicenter studies are needed to improve the quality of orthodontic care and, consequently, the quality of life of adolescents and their families.[34]

CONCLUSIONS

- The first 8 months of orthodontic treatment with a fixed appliance had a positive impact on the families of adolescents.

- Significant improvements occurred, mainly with regard to parental/family activity and parental emotions.

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