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Assessment of oral hygiene and quality of life in rehabilitated patients with fixed parcial dentures

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Abstract: Objective: Analyze the influence of oral hygiene guidance for the maintenance of fixed partial dentures (FPD) and the influence of this treatment on the quality of life (QL) of rehabilitated patients. Material and Methods: The Simplified Oral Hygiene Index (OHI-S) and Bleeding on Probing Index (BOP) methods was employed to evaluate oral hygiene (OH), and the OHIP-14 questionnaire to assessment QL. The sample consisted of 33 patients (26 females and 7 males, mean age 51.53 years) in treatment with FPD. The OH and QL assessments were conducted in temporary FPD placing session and 30 days after definitive cementation. Results: OHI-S and BOP showed increasing results ($p < 0.05$) comparing initial and final assessments. There was a negative correlation between OHI-S and BOP, in both periods of analysis. The OHIP-14 showed a significant result according to the Likert scale scores, with an impact reduction from 9.33 to 0.57. Conclusions: It was concluded that FPD rehabilitations need of properly oral hygiene guidance, that could be influence on oral health status. In addition, the FPD rehabilitation improved the QL of the patients.

Key-words: fixed dental prosthesis, dental hygiene, quality of life.

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Introduction

Several years ago, for the prosthetic rehabilitation of individuals with partial tooth loss several options are indicated, among them, adhesive-fixed partial denture, implant prosthesis and conventional fixed partial denture (FPD) [1]. The success tooth-supported FPD depends of several factors, since the correct indication, adequacy of clinical / laboratory procedures, and maintenance

care by patient. Poor oral hygiene, over time, can lead problems such as dental caries, gingival inflammation and periodontal disease, the main causes of complications of FPDs [2].

FPDs are largely dependent on health and stability of surrounding periodontal tissues. The gingival tissue should have a sulcus depth between 1–3 mm and an adequate gingival thickness. Plaque bacteria play an important role in the etiology of oral diseases, such as dental caries, gingivitis, and periodontitis [3–5]. Knowledge of periodontal responses to FPD is crucial for the development of a treatment plan with a predictable prognosis [6].

FPD abutment teeth accumulate more plaque, which may develop marginal inflammation, and consequently can have greater probing depth when compared to non-abutment teeth. Different types of FPDs can cause greater or lesser difficulty in cleaning by the patient. The single crowns appear to be easier to clean when compared to the pontic-FPD [7]. However, effective oral hygiene care result in few periodontal changes around abutment teeth [8–11]. Furthermore, dental aids, such as dental floss, floss threader and interdental brushes are indispensable methods that should be used in addition to traditional oral hygiene methods to perform plaque control [7]. Therefore, careful maintenance is necessary through the patient's motivation regarding oral hygiene habits, emphasizing that such care leads to sensitive success rates of treatments with FPD [12–14].

The tooth loss can cause disorders related to function, aesthetics, and self-esteem in the individual. The assessment of the impact of rehabilitation treatments on patients' quality of life (QL) is an issue that has increased in recent years [15]. The use of measurement instruments, such as the Oral Health Impact Profile [16] (OHIP-14), to determine the individual's perception, after treatment, is a true reflection of the patient's opinion regarding their expectations, frustrations, or satisfaction.

This study aimed to analyze the influence of hygiene guidance for the maintenance of fixed partial dentures by clinical parameters (bleeding on probing and index oral hygiene), and the impact of this treatment on quality of life by OHIP-14.

Materials and Methods

Sample selection

The study was approved by the Ethics Committee of the School of Dentistry Ribeirão Preto / USP (CAAE: 73565517.1.0000.5419). Thirty-three patients (26 females, 7 males, aged between 19 and 84 years (mean 51.53 years)) treated at the teaching clinic who would be rehabilitated with FPD and who agreed to participate in all stages of the research were selected.

Study design

This study was divided in two stages:

STAGE 1: performed after temporary FPD cementation. The interview questionnaire was administered, obtaining the patient's information and data regarding the patient's oral hygiene knowledge and habits, and the Oral Health Impact Profile questionnaire (OHIP-14). The Simplified Oral Hygiene Index (OHI-S) [17] and the Bleeding on Probing Index (BOP) [18] were performed to the FPD abutment teeth. Patients received professional guidance on oral hygiene maintenance of FPD by demonstrative orientations using macro-models, receiving at the final a self-explanatory leaflet containing the same guidance.

STAGE 2: performed 30-days after definitive cementation. The patients answered a new interview questionnaire about the possible difficulties on hygiene of FPD and current hygiene habits. The QL questionnaire (OHIP-14) was administered and the final assessment of the OHI-S and BOP scores of the FPD abutment teeth was performed.

OHI-S and BOP evaluation

The intraoral evaluations were performed by a single observer, previously trained, and calibrated by a researcher experienced in applying the indices. OHI-S [17] is based on the examination of six representative dental surfaces: vestibular of the first right and left first molars, lingual of the first right and left lower molars and the vestibular surface of the right upper and lower left central incisor. A plaque disclosing solution based on basic fuchsin (Eviplac, Biodinâmica, Ibiporã, Paraná, Brazil) was employed, administered with the aid of a swab. The scores were determined for each tooth selected according to Square 1. In the absence of one of the teeth or in the presence of extensive caries, the corresponding surface of the subsequent tooth was examined.

Square 1. OHI-S scores and criteria for assessment.

Scores	Description
0	Clean tooth and total absence of bacterial biofilm
1	Tooth presents 1/3 of its surface with bacterial biofilm
2	Tooth has biofilm up to 1/2 of its surface
3	Tooth shows biofilm beyond 1/2 of its surface

For the evaluation of the Gingival Bleeding Index [18], a periodontal probe (Hu-Friedy — USA) was gently inserted in the gingival sulcus with movements from distal to mesial on the buccal and lingual / palatal surfaces of the teeth to detect bleeding points. In cases of bleeding, a score of 0 was determined, and non-bleeding, a score of 1. This index was administered only to the FPD-abutment teeth.

Evaluation of the Impact of Oral Condition on QL (OHIP-14)

The OHIP-14 instrument was employed to measure the impact that oral condition, before and after rehabilitation, would have on the quality of life of the research participants. For all questions, patients could choose one of the 5 answer possibilities (never, almost never, occasionally, often, very often) and, using the Likert scale, a score was associated with each answer: 0 = never, 1 = rarely, 2 = sometimes, 3 = often, 4 = always, with the maximum possible score reaching 56 points. In OHIP-14, seven domains can be evaluated, according to the questions (Square 2). The overall impact was given by the sum of the average impact of each question in each domain and was considered weak with an index less than 9.33, medium with an index between 9.33 and 18.66, and strong with an index greater than 18.66 [19].

Data analysis

Statistical analysis was performed with SPSS Version 25.0 statistic software package. The intra-examiner agreement was performed before the study (kappa = 0.94). During data collection, the mean of 0.92 (kappa = 0.92) was reached, denoting high intra-examiner agreement at both times.

Square 2. OHIP-14 domains.

Question	Domains
Have you had trouble pronouncing any words because of problems with your teeth, mouth or dentures? Have you felt that your sense of taste has worsened because of problems with your teeth, mouth or dentures?	Functional limitation
Have you had painful aching in your mouth? Have you found it uncomfortable to eat food because of problems with your teeth, mouth or dentures?	Physical pain
Have you been self-conscious because of your teeth, mouth or dentures? Have you felt tense because of problems with your teeth, mouth or dentures?	Psychological discomfort
Have you been self-conscious because of your teeth, mouth or dentures? Have you felt tense because of problems with your teeth, mouth or dentures?	Physical disability
Has your diet been unsatisfactory because of problems with your teeth, mouth or dentures? Have you had to interrupt meals because of problems with your teeth, mouth or dentures?	Psychological disability
Have you found it difficult to relax because of problems with your teeth, mouth or dentures? Have you been a bit embarrassed because of problems with your teeth, mouth or dentures?	Social disability
Have you felt that life in general was less satisfying because of problems with your teeth, mouth or dentures? Have you been totally unable to function because of problems with your teeth, mouth or dentures?	Deficiency

Data on oral hygiene habits were organized and presented by descriptive statistics, through the distribution of frequency and percentage. T-Student test was performed to compare the initial and final averages of the OHI-S and BOP scores (5% significance level). Scores founded in the OHIP-14 were organized and the paired Wilcoxon T test was performed, at the 5% level of significance. Means and standard deviation were analyzed, before and after treatment. The QL variations of between the sample before and after the FPDs insertion were compared. Pearson's chi-square association test was performed to assess the correlation between variables, verifying the possible association between them, correlated variables were those with $p < 0.05$.

Results

Thirty-three were evaluated, of these, 26 (78.79%) were female and 7 (21.21%), male. The patients were asked about their educational level, 9 (27.2%) had completed elementary school, 20 (60.6%) had completed high school and 4 (12.12%) patients attended higher education. The average age found for the patients in this study was 51.39 years (ranging from 18 to 81 years). Regarding the type of FPD that was inserted, 16 were pontic-FPDs (48.48%) and 17 (51.52%) were unitary FPDs.

Table 1. Absolute frequency of data referring to hygiene guidance.

Question	n = 33	%
Have you received guidance on hygiene?		
Yes	27	81.82
No	6	18.18
Where did you receive this information?		
School	2	6.06
Friends	1	3.03
Dentist	24	72.73
Relatives	0	0
Not received	6	18.18

Data on oral hygiene habits and routines are presented in Table 1. The results show that most patients have already received oral hygiene guidance (81.82%) and that the dentist was responsible for instructing patients in most cases (72.73%).

Subsequently, patients were asked regarding oral hygiene habits they maintained before receiving oral hygiene guidance — Table 2. The data show that most patients brushed their teeth at least 3 times a day (45.46%). Regarding the use of dental floss, 81.82% of patients reported their use, emphasizing that for 30.31% of these, dental floss was difficult to use. Another important fact is that more than half of the patients reported gingival bleeding (54.55)%.

Table 3 contains the patients' perceptions regarding oral hygiene habits, after 30 days of cementing the FPD. A total of 36.36% of patients reported difficulties in cleaning the prosthesis, even after receiving previous oral hygiene instruction. A relevant data was the decrease in the number of patients who reported using dental floss compared to what was reported at the beginning of the research. A part of the patients (30.31%) reported that the time spent for its use is one of the factors that hinder the use of dental floss. Both before and after treatment, patients were asked about the use of mouthwash, of which, initially, 57.58% reported using it, a number that increased after the oral hygiene instruction (66.67%). Finally, there was a significant reduction in relation to the data found regarding gingival bleeding during tooth brushing (21.21%).

Regarding to OHI-S, the referring data are shown in Table 4, indicating the absolute frequency of the classification of the scores, the mean and the standard deviation before and after the completion of the treatment. On average, OHI-S scores before treatment (1.88 ± 1.009) were higher than OHI-S scores after treatment (1.49 ± 0.883), showing a statistically significant difference, $t(32) = 3.735$ $p = 0.001$ ($p < 0.05$).

The BOP evaluation showed that there was an improvement in the mean bleeding at the initial survey (0.33 ± 0.479) and the final one (0.64 ± 0.489), showing a statistically significant difference, $t(32) = -3.288$ $p = 0.002$ ($p < 0.05$).

Regarding the assessment of quality of life by the OHIP-14 questionnaire, the questions Q1, Q2, Q8, Q12 and Q14 did not present statistically significant differences in the studied sample. The questions Q3, Q4, Q5, Q6, Q7, Q9, Q10, Q11 and Q13 showed statistically significant differences. The data for the frequency associated with each question and the p values found in the statistical analysis are shown in Table 5.

Table 2. Patients' habits and routines regarding oral hygiene.

Question	n = 33	%
Daily brushing frequency		
1 time	1	3.03
2 times	11	33.33
3 times	15	45.46
4 times or more	6	18.18
How often do you change your brush per year?		
4 times a year	11	33.33
3 times a year	10	30.31
2 times a year	9	27.27
Once a year	3	9.09
Do you floss?		
Yes	27	81.82
No	6	18.18
How do you evaluate the use of dental floss?		
Late	8	24.24
Difficult	10	30.31
Expensive	3	9.09
I prefer another method	6	18.18
I don't use wire	6	18.18
How do you use the floss?		
Only with hands	25	75.76
Superfloss	1	3.03
Floss threader	1	3.03
I don't floss	6	18.18
Do you use mouthwash?		
Yes	19	57.58
No	14	42.42
When brushing your teeth, your gums bleed?		
Yes	18	54.55
No	15	45.45

Table 3. Absolute frequency of data regarding patients' perceptions 30 days after definitive cementation of FPD.

Question	n = 33	%
Are you having difficulties in cleaning the prosthesis?		
Yes	12	36.36
No	21	63.64
Are you using dental floss?		
Yes	25	75.76
No	8	24.24
How are you cleaning the prosthesis?		
Superfloss	13	39.39
Floss threader	4	12.12
Interdental brush	10	30.31
Other	6	18.18
What is your biggest difficulty when doing interdental cleaning?		
Find the right method	6	18.18
Buy the right product	9	27.27
Carry out the cleaning	8	24.24
Not having time to perform	10	30.31
Do you use mouthwash?		
Yes	22	66.67
No	11	33.33
When brushing your teeth, your gums bleed?		
Yes	7	21.21
No	26	78.79

Table 4. Mean and standard deviation of OHI-S before and after treatment.

	Good	Regular	Poor	OHI-S mean and standard deviation
Before	12	12	9	1.884 ± 1.009*
After	18	10	5	1.491 ± 0.883*

* $p = 0.001$; $p < 0.05$ statistically significant difference.

Table 5. Frequency associated with each OHIP-14 questioning and p values.

	Initial					Final					p-value
	Never	Almost never	Occa-sionally	Often	Very often	Never	Almost never	Occa-sionally	Often	Very often	
Q1	87.9% (29)	6.1% (2)	3.0% (1)	3.0% (1)	0.0% (0)	93.9% (31)	3.0% (1)	3.0% (1)	0.0% (0)	0.0% (0)	0.395
Q2	87.9% (29)	6.1% (2)	3.0% (1)	3.0% (1)	0.0% (0)	97.0% (32)	3.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	0.131
Q3	18.2% (6)	15.2% (5)	51.5% (17)	15.2% (5)	0.0% (0)	87.9% (29)	3.0% (1)	9.1% (3)	0.0% (0)	0.0% (0)	<0.001
Q4	33.3% (11)	39.4% (13)	21.2% (7)	3.0% (1)	3.0% (1)	93.9% (31)	6.1% (2)	0.0% (0)	0.0% (0)	0.0% (0)	<0.001
Q5	42.4% (14)	33.3% (11)	15.2% (5)	6.1% (2)	3.0% (1)	97.0% (32)	3.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	<0.001
Q6	57.6% (19)	21.2% (7)	15.2% (5)	6.1% (2)	0.0% (0)	93.9% (31)	6.1% (2)	0.0% (0)	0.0% (0)	0.0% (0)	<0.002
Q7	42.4% (14)	18.2 (6)	18.2% (6)	18.2% (6)	3.0% (1)	97.0% (32)	3.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	<0.001
Q8	87.9% (29)	6.1% (2)	6.1% (2)	0.0% (0)	0.0% (0)	100.0% (33)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.063
Q9	42.4% (14)	42.4% (14)	12.1% (4)	3.0% (1)	0.0% (0)	97.0% (32)	3.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	<0.001
Q10	24.2% (8)	12.1% (4)	33.3% (11)	27.3% (9)	3.0% (1)	97.0% (32)	3.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	<0.001
Q11	81.8% (27)	9.1% (3)	6.1% (2)	3.0% (1)	0.0% (0)	100.0% (33)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.026
Q12	87.9% (29)	6.1% (2)	6.1% (2)	0.0% (0)	0.0% (0)	100.0% (33)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.063
Q13	84.8% (28)	6.1% (2)	6.1% (2)	3.0% (1)	0.0% (0)	100.0% (33)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.041
Q14	100.0% (33)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (33)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	1.000

According to the Likert scale, it was possible to establish the average of the values found before and after the predicted treatment — Table 6. According to the sum of the averages of the values found, the data reflect an average impact of 9.33 found previously at installation of FPDs, obtaining a significant reduction (0.57) after the installation of the prosthesis, indicating a low impact.

In the analysis of the average impact values, it was found that there was a statistically significant difference when comparing the impact of oral health on the quality of life of patients before and after the installation of FPDs ($p = 0.012$) — Table 7.

Pearson's chi-square association test with residual analysis was used to analyze possible correlations between the variables analyzed. Values of $p < 0.05$ were considered statistically significant. For the educational level variable, scores were determined; elementary school (score = 0), high school (score = 1) and higher education (score = 2). For the variable FPD type, the scores 0 (unitary FPD) and 1 (pontic FPD) were designated. Bleeding on brushing received scores 0 (present) and 1 (absent). Table 8 shows the r (Person's correlation) values for the correlation between the values obtained for the OHI-S correlated with educational level, age, BOP and OHIP. Significant correlations between OHI-S and BOP values were observed, which means that as the OHI-S value increases, the chances of gingival bleeding increase, both in the analysis before and after treatment. Regarding the possible correlations between BOP, before and after treatment, with the variables educational level, age, bleeding on brushing and total value of OHIP-14 scores, a positive correlation was observed only between BOP and Bleeding on Brushing, where after treatment patients who noticed their bleeding gums had positive ISS — Table 9.

Table 6. Mean of the values found according to the OHIP-14 domains.

OHIP — Domains	Score	Time	
		Before	After
Functional limitation	0–8	0.42	0.12
Physical pain	0–8	2.66	0.27
Psychological discomfort	0–8	1.63	0.09
Physical disability	0–8	1.39	0.03
Psychological disability	0–8	2.48	0.06
Social disability	0–8	0.48	0
Deficiency	0–8	0.27	0
Total	**0–56**	**9.33**	**0.57**

Table 7. Impact found for OHIP — 14 values.

OHIP-14	Time	Mean	Standard Deviation	p-value
	After	1.33	0.98	0.012
	Before	0.08	0.09	

Table 8. Pearson's correlation (r) and p values between OHI-S before and after treatment with the variables educational level, age, BOP and total value of OHIP-14 scores.

	Educational level		Age		BOP		OHIP	
	p-value	r	p-value	r	p-value	r	p-value	r
After	0.975	0.006	0.837	–0.037	0.0038#	–0.364	0.453	0.135
Before	0.833	0.038	0.544	–0.110	0.000#	–0.584	0.253	–0.205

p = significance.
# Significant negative correlation at 5% significance level.

Table 9. Pearson (r) correlation between BOP before and after treatment with the variables educational level, age, bleeding on brushing and total value of OHIP-14 scores.

	Educational level		Age		Bleeding from brushing		OHIP	
	p-value	r	p-value	r	p-value	r	p-value	r
After	0.327	0.176	0.551	–0.108	0.147	0.258	0.374	–0.160
Before	0.917	0.019	0.459	0.133	0.001#	0.532	0.077	0.312

p = significance.
# Significant negative correlation at 5% significance level.

Discussion

This work aimed to assessment the impact of oral hygiene guidance on patients who received treatment with FPD. These orientations consisted of brushing techniques, flossing and use of chemical methods for plaque control. It was highlighted that the potential benefits of guidance consisted of promoting improvements in the longevity of natural dentition and newly inserted prostheses. Furthermore, the impact that the insertion of new prostheses had on patients' quality of life was studied.

Although there are many dental aids available, some patients do not have socioeconomic conditions for acquisition of dental floss, floss threader, interdental brush, among others [20, 21]. Other factors can influence the success of oral hygiene programs, such as family and social factors, norms, beliefs, values and common practices [22, 23]. In the present study, corroborating other studies [12, 24–26], patients were informed about the fact that periodic follow-up visits are an important way of verifying the current state of prosthesis / dentition and to reinforce hygiene guidance, essential conditions for maintaining oral health.

According to the results, 63.64% of patients had difficulty cleaning their FPDs, a high number that indicates the need to reinforce oral hygiene guidance in subsequent control sessions. One of the reasons that hinder hygiene is the access to dental hygiene aids in the interproximal areas and under the FPD pontics [27]. In addition, 27.27% had difficulties in purchasing the right cleaning aid. Geiballa *et al.* [28], founded that 94% of the patients evaluated after the rehabilitation

treatment reported not using supplementary methods for cleaning prostheses. Implying in a failure in professional-patient communication that can harm the prognosis of the treatment performed. Often, patients have the mistaken perception that the cemented prosthesis is permanent, hoping that nothing else is necessary for its maintenance. Therefore, dentists guidance regarding the future care for the maintenance of the prosthesis and the remaining teeth is paramount [29]. In addition, the type of prosthesis can impact the development of caries and periodontal disease, pontic-FPDs have a 27% higher risk of developing caries compared to unitary prostheses, however, these risks can be minimized with the implementation of a dental care program maintenance involving personal and professional care [12].

Significant results were found in relation to the OHI-S and BOP indexes after the rehabilitation treatment with FPD, which allows us to conclude that the oral hygiene guidance was effective in controlling plaque. However, according to what was observed in Table 8, is possible to find a correlation between BOP and OHI-S, that is, patients who had high values for OHI-S were susceptible to positive values for BOP. In addition, brushing bleeding was correlated with BOP after treatment. Periodontal disease is considered a frequent complication in rehabilitation treatments with FPD [30, 31]. In the study by Erdemir *et al.* [32] greater probing depth, plaque index in teeth supporting FPDs was observed. Goodacre *et al.* [33] reported that caries is one of the main complications of FPDs. Tan *et al.* [34] found that the teeth supporting FPD had a 5.8% incidence of caries over a period of 5 years. According to these studies and knowing that the biological complications of FPDs are frequent, our study showed a significant improvement for OHI-S and BOP, however the ideal would be the long-term monitoring of the oral health condition of patients, in cases where plaque control was not effective on the part of the patient.

The QL evaluation aimed of verifying whether both the rehabilitation treatment would bring positive results in relation to QL. The need to evaluate a given treatment from the patient's point of view motivated the use of an instrument to measure QL related to oral health. OHIP-14 focuses on the frequency of complaints related to general dentition over time [35]. The QL improvement in patients rehabilitated with FPD was quite noticeable through the application of the OHIP-14 questionnaire. Most domains showed significant differences between the initial and final periods of treatment. The subjective assessment of satisfaction with FPD treatment is not well described, as few studies [15, 36–39] have investigated the impact of FPDs on QL, however, the results found in this study indicate that the prosthetic treatment performed was effective in improving the QL. In addition, the method of assessing QL using questionnaires can be an economical way of conducting studies in patients with prosthetic rehabilitation, due to the high agreement between self-reports and clinical findings [40].

No significant differences were found in any of the variables studied with respect to gender, age, and education level. However, in this study the percentage of females was higher than that of males, which suggests that women are more concerned with replacing missing teeth. These results are in line with previous investigations that have shown that women are more critical regarding dentofacial appearance [28, 41, 42].

Within the limitations of this study, difficulties were found in obtaining a large sample, probably because the treatments were performed in an educational institution by undergraduate students under the supervision of the faculty, making it difficult to collect subsequent controls, a fact that is harmful to the expansion of sample analyzed. It is worth mentioning that, similarly to the results obtained in this study, research conducted in different countries offered interesting feedback on the satisfaction of patients with prostheses performed by higher education students [43].

Conclusion

According to the above, it is possible to conclude that oral hygiene and maintenance guidance for FPDs positively influenced the clinical parameters (OHI-S and BOP) and that rehabilitation with FPD improved the QL of the patients evaluated.

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Conflict of interest

None declared.

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