

Data collection about failures in fixed partial dentures: 1-year monitoring

Levantamento das falhas em prótese parcial fixa: acompanhamento de um ano

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ABSTRACT

Objective

The aim of this study was to evaluate the satisfaction of patients rehabilitated with fixed partial denture and the incidence of failures/clinical complications of prostheses after one year.

Methods

The patients answered a questionnaire about the satisfaction degree with dental treatment performed and care maintenance for prosthesis conservation. Clinical and radiographic evaluations of the prosthesis were performed. Data were tabulated for descriptive analysis of the factors assessed, with calculation of absolute frequencies and percentages, and chi-square and Fisher's exact test.

Results

A total of 9.67% failures were found. The most common was the prosthesis loosening (57.14%), followed by ceramic fracture (28.57%), and abutment tooth fracture (14.29%). Biological failures were observed in 30.65%. The most common failure was gingival recession (52.00%), periodontal pocket (24.00%), support periodontal involvement (16.00%), and recurrent caries (4.00%). Radiographic examination showed that 70.97% of the total number evaluated had some kind of failure. There was statistically significant association between satisfaction degree and technical failure ($p=0.04$).

Conclusion

Patients were satisfied after observation period of 1 year. The main failures detected were: crown cementation failure and ceramic fracture; gingival recession, periodontal pocket; manufacture and cementation of short intraradicular post with increased diameter and crown cervical misfit.

Indexing terms: Patient satisfaction. Fixed partial denture. Failures.

RESUMO

Objetivo

O objetivo deste estudo foi avaliar a satisfação dos pacientes reabilitados com prótese parcial fixa e a incidência de falhas/complicações clínicas das próteses instaladas após um ano.

Métodos

Os pacientes responderam um questionário abrangendo o grau de satisfação pelo tratamento odontológico efetuado e os cuidados de manutenção realizados para a conservação da prótese. Na sequência foi realizada avaliação clínica e radiográfica das próteses. Os dados obtidos foram tabulados para análise descritiva dos fatores avaliados com cálculo de frequência absoluta e percentual, e teste de Qui-quadrado e Fischer.

Resultados

Foram encontradas 9,67% de falhas, sendo a mais comum a descimentação (soltura da prótese) (57,14%), seguida da fratura da cerâmica (28,57%), e um caso de fratura no dente pilar (14,29%). As falhas biológicas foram observadas em 30,65%. A falha mais comum foi a recessão gengival (52,00%), seguida por bolsa periodontal (24,00%), envolvimento periodonto de suporte (16,00%), e recidiva de cárie (4,00%). No exame radiográfico 70,97% do número total avaliado apresentaram algum tipo de falha. Houve associação estatisticamente significativa entre grau de satisfação e falhas mecânicas ($p=0,04$).

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Conclusão

Os pacientes ficaram satisfeitos após um período de acompanhamento de 1 ano. As principais falhas detectadas foram: falha de cimentação da coroa e fratura da cerâmica; Recessão gengival, bolsa periodontal; confecção e cimentação de pino intraradicular curto, pino com diâmetro aumentado e desajuste cervical da coroa.

Termos de indexação: Satisfação do paciente, Prótese parcial fixa, falhas.

INTRODUCTION

Rehabilitation performed with Fixed Partial Denture (FPD) is one of the most accepted and desired by patients [1]. However, it is a long procedure and generates high expectations from patient. Once the professional knows the factors that create dissatisfaction or contribute to failures, the dentist could minimize them and thus meet all the patient's needs and establish the most appropriate planning [2].

The success of rehabilitation treatment could be evaluated by patient satisfaction and comfort and the longevity of the prosthesis. Some factors that determine treatment satisfaction are: comfort, function and aesthetics [3]. These factors are strongly linked to the professional expertise, fees, professional/patient relationship and the prostheses quality.

The quality of prostheses is related to immediate failures due to a shortage of criteria in the stages of prostheses manufacturing, such as errors in color and form selection, phonetic changes or even food impaction; as well as late failures related to biological factors such as caries, periodontal disease and endodontic complications or technical failures, such as loss of retention, cracks and subsequent fractures, loss of the coating material, metal framework fracture, spot weld, abutment tooth and marginal defects [4-7]. These factors individually or together can influence the survival, longevity and success of the prostheses.

The main cause of prosthesis failure was lost or caries of abutment teeth and periodontal problems [4,5]. Caries recurrence in abutment teeth is directly related to patient hygiene and to the adjustment of prosthetic pieces by the professional. On the other hand, the periodontal disease progression may be related to deficiency in oral and general patient's health [8], smoking habits and genetic factors [9], besides the presence of malocclusion and bruxism [1,10]. The period of treatment, which is professional's responsibility, could have an impact on supporting and protection periodontal tissues, especially in the stages of preparation, impression and prostheses contouring.

Complications resulting from rehabilitation treatment with prostheses are factors that may occur during or after treatment [11]. The dentist should know such complications, in order to be able to conclude a detailed diagnosis, treatment planning and execution of procedures giving special attention to the most frequent failure factors, and thus meeting the patient's expectations and planning the post-treatment care and maintaining [12].

Therefore, the aim of this study was to evaluate the satisfaction of patients rehabilitated with fixed partial denture and the incidence of failures/clinical complications of prostheses after one year in patients treated at Araçatuba Dental School - UNESP.

METHODS

The research was submitted to the analysis of Research Ethics Committee - CEP (Resolution No. 01 of 13/06/98 - cns), and after approval it was registered under the protocol 01079/2011.

Sample

The questionnaire was applied to patients enrolled at graduation clinics of Araçatuba Dental School - UNESP for treatment with fixed partial dentures. The prostheses evaluation period was one years after its installation. The study included 62 patients from both genders, over 18 years old. Patients who agreed to participate signed a consent form. The exclusion criterion was the patient's refusal to answer the questionnaire and to be examined.

The Clinical evaluation was conducted by the same examiner in all stages of the process after its calibration guided by the teacher responsible for the research. The clinical examination was carried out with the dental explorer, periodontal probe and mouth mirror to identify mechanical failures such as: fractures in metal (infrastructure), fracture of ceramic, welding, abutment tooth and perforation of the prosthesis, cement failure, adaptation retainer and contact point, and biological failures such as: gingival recession, periodontal pocket, involvement of periodontal

support and recurrent caries.

After the clinical examination and applied the questionnaire, periapical radiographs were taken with the use of radiograph positioner to examine caries, endodontic lesions, periodontal problems, fractures, as well as the condition of intraradicular retainers.

Instruments used

Chart 1. This evaluation was conducted by analysis of the guided interview structured questionnaire.

Name: _____ Register _____	
Gender: () F () M	Age: _____
Educational level: () Elementary () Secondary () Higher	
QUESTIONNAIRE	
In relation to your prostheses, what is the level of satisfaction:	
Functional (Chewing)	Maintenance:
() Great () Good () Dissatisfaction () Always	() Great () Good () Dissatisfaction () Sometimes
() Great () Good () Dissatisfaction () Never	() Great () Good () Dissatisfaction () Never
What is the condition of denture hygiene?	
() Easy hygienization () Difficult hygienization () not performing proper hygiene	
CLINICAL EXAMINATION	
Time of installation of the prosthesis: _____	
Single prosthesis: () n°	Material: _____ () anterior tooth _____ () posterior tooth
Fixed prostheses: () n°	Material: _____ () anterior tooth _____ () posterior tooth
Tooth (s) abutment (s): _____	
Tooth (s) Absent (s): _____	
Pontic (s): _____	
Failures:	
MECHANICAL	BIOLOGICAL
() Ceramic fracture	() Recurrent caries
() Metal fracture	() Endodontic involvement
() Weld fracture	() Periodontal involvement
() Abutment tooth fracture	() Gingival recession _____mm
() Root fracture	
BIOLOGICAL-MECHANICAL	
() Prosthesis's perforation	() Oclusal
() Cementation failure	() Aesthetic
() Failure to adapt retainer	
() Lack of contact point	
RADIOGRAPHIC EXAMINATION	
() Cervical misfit of the crown	
() Carie lesion	
() Periapical lesion	
() Lamina dura thickening	
() Bone loss (defect)	
() Abutment fracture	
() Radicular fracture	
Intraradicular post:	
() Short post	() Long post
() Post with increased diameter	() Post with reduced diameter
() Cervical maladjusted posts	() Apically maladjusted posts
() Root canal deviation	
() Inadequate apical seal	
() Inadequate root canal treatment	

Which was applied to collect the information. The questionnaire consisted of socio-demographic questions including gender, age and educational level, issues related to satisfaction with the treatment and hygiene care after cementation of the prosthesis.

Subsequently, clinical and radiological evaluations were performed to verify the prostheses and abutment teeth conditions.

Data were tabulated for descriptive analysis of the factors assessed with calculation of absolute and percentage frequency, and Chi-square and Fisher's exact test to verify the association between variables: satisfaction degree and gender, age, education, biological and technical failures.

RESULTS

The sample consisted of 62 patients, 40 female (65%) and 22 male (35%), with mean age of 47.40 years and standard deviation of 9.90. For educational level, 18 patients had only completed primary education (29.03%), 34 the high school (54.84%), and only 10 have higher education (16:13%). When asked about their satisfaction level with the prosthetic treatment received, 17 patients manifested as unsatisfactory (27.42%), 23 as good (37.10%) and 22 considered the prosthesis as great (35.48%).

A total of 74% of the interviewer reported not presenting difficulties for prosthesis hygiene. However, (26%) reported not performing proper hygiene, due to some difficulties. In the present study, among patients who had difficulties at the time of cleaning, (56%) stated that did not know any of oral hygiene instructions. Regarding flossing, (43%) do not use. Of the 62 interviewees, (80%) reported that they had not been informed about the necessity of periodic returns.

Technical failures

Only 6 patients (9.67%) presented technical failures (Table 1).

Table 1. Technical failures.

Cementation failure	4
Ceramic fracture	2
Abutment tooth fracture	1
Total	7

In their fixed partial dentures. In one patient two failures were identified. Altogether, 7 technical failures were observed and the most common was the prosthesis loosening presented in 4 cases (57.14%), followed by ceramic fracture in 2 cases (28.57%), and one case of abutment tooth fracture (14.29%).

Biological failures

Biological failures were observed in 19 patients (30.65%). A total of 25 biological failures were listed, since some patients exhibited more than one occurrence. The most common failure was gingival recession in 14 cases (52%), followed by periodontal pockets in 6 cases (24%), periodontal involvement in 4 cases (16%), and recurrent caries (4%) reported in one patient (Table 2).

Table 2. Biological failures.

Gingival recession	14
Periodontal pockets	6
Periodontal involvement	4
Recurrent caries	1
Total	25

Biological-technical failures

Clinical evaluations did not identify the occurrence of biological-technical failures, such as occlusal and aesthetic failures, as stated by Karoussis et al.[13] and Bragger[8].

Radiographic failures

Radiographic examination showed that from the total number evaluated, 44 patients (70.97%) had some kind of failure (Table 3).

Table 3. Radiographic failures.

Absence of intraradicular post	1
Cervical misfit of the crown	5
Lamina dura thickening	1
Root canal deviation	2
Cimentation failure	1
Lack of apical seal	1
Periapical lesion	1
Bone loss	10
Inadequate root canal treatment	10
Short post	16
Long post	1
Apically maladjusted posts	2
Cervical maladjusted posts	2
Post with increased diameter	2
Post with reduced diameter	1
Inadequate apical seal	1
Total	57

Correlation between variables

In Table 4 was presented the correlation between variables, the chi-square test and Fisher's exact test considered the variable "satisfaction degree" as satisfactory and unsatisfactory, the categories "Great" and "Good" was considered like Satisfactory and Unsatisfactory. Biological and technical failures were classified as present or absent. The age range was divided into 48 years or less and more than 48 years, based on

the sample median.

There was statistically significant association between satisfaction degree and technical failures ($p=0.04$). For the other variables, the associations were not statistically significant: gender ($p=0.07$); educational level ($p=0.74$); age range ($p=0.48$); and biological failures ($p=0.27$).

Table 4. Correlation between satisfaction degree and gender age, educational level, mechanical and biological failures.

Variables	Satisfaction		Dissatisfaction		Total		p value
	n	%	n	%	n	%	
Gender:							
Female	26	65,00	14	35,00	40	100	0.07
Male	19	86,36	3	13,64	22	100	
Age range:							
≤48	22	68,75	10	31,25	32	100	0.48
> 48	23	76,67	7	23,33	30	100	
Educational level							
Elementary	12	66,67	6	33,33	18	100	0.74
Secondary	25	73,53	9	26,47	34	100	
Higher	8	80,00	2	20,00	10	100	
Biological failure							
Absent	33	76,74	10	23,26	43	100	0.27
Present	12	63,16	7	36,84	19	100	
Mechanical failure							
Absent	43	76,79	13	23,21	56	100	0.04*
Present	2	33,33	4	66,67	6	100	

*Fisher's exact test.

After all examinations were performed, questionnaires were evaluated individually and the overall rating of such faults was conducted as proposed by Ozcan and Niedermeier [12]:

Class I: The failure cause is correctable without replacing the restoration.

Class II: The failure cause is correctable without replacing the restoration, however, the support tooth structure or foundation requires repair or reconstruction.

Class III: Failure requires only the restoration replacement. Support tooth/structure is acceptable.

Class IV: Failure requires replacement of restoration, besides demanding repair or reconstruction of the tooth/foundation support structure.

Class V: Insufficiency with loss of support tooth or inability to rebuild the use of original tooth support. Replacement of fixed prosthesis remains possible through

the use of other complementary support for restoration or the redesign.

Class VI: Insufficiency with loss of support tooth or impossibility to reconstruct the support tooth like the original. Replacement of conventional fixed prosthesis is not possible.

When considering technical (7 occurrences), biological (25 occurrences), biological-technical (0 occurrence) and radiographic (57 occurrences) failures, a total of 89 occurrences is reported.

The events were classified as Class I in 97.75% of cases, ie, faults could be corrected without replacement of prosthetic restoration. As an example of this occurrence cementation failures could be observed.

Radiographic findings, also classified as Class I, demonstrated the need to inform the patient about the necessity of monitoring the restorations. An example of this occurrence is the apically maladjusted posts.

A special conduct was adopted for patients with gingival recession. These patients were instructed individually for a proper brushing technique by the scholarship student.

There was one caries recurrence in the abutment tooth and this failure was classified as Class II (1.12%).

One occurrence was classified as Class IV (1.12%). This event refers to the abutment tooth fracture. In this case, the failure required the replacement of the prosthetic restoration and the abutment tooth repair, with the confection of an intraradicular retainer.

DISCUSSION

Treatment with fixed partial denture considered long and with high costs generates great expectations for the patient. Although dedication, careful planning and meticulous attention to every detail have been expended, failures and patient dissatisfaction with final results are not rare, being one of the most frustrating aspects of dental practice.

The questioning of the patients started with questions about their satisfaction regarding prostheses aesthetics and function. Most of the patients were satisfied with their prosthesis (72.58%), and only (27.42%) of the interviewees considered them unsatisfactory. Also, good patient satisfaction was found in an 18-year retrospective analysis [4].

Despite the results have not shown statistical significance ($p=0.07$), men (86.36%) were more

satisfied with the prosthesis than women (65%). Studies demonstrated that when questioned about satisfaction level with oral aesthetics, the female gender was also less satisfied [14,15].

While aging is seen as a gradual process, the feeling of "being old" occurs as a result of something abrupt, caused by some event that could precipitate it, such as the loss of teeth. In this study, there was no correlation between age and satisfaction with the prosthesis ($p=0.48$), but the older patients obtained a higher satisfaction percentage (76.67%). Newsome3 also found that age did not affect the prosthetic contentment.

The biological failure occurs when there is an inadequacy of the host, concerning the prosthesis maintenance and stability [16]. The most frequent biological failure was gingival recession, followed by periodontal involvement, cementing failures and recurrent caries, similar results were found in a retrospective study, with 59% of gingival recession [4]. The great incidence of gingival recession can be attributed to the difficulty of hygienization (absent or very traumatic to tissues), or even to iatrogeny from the dentist when preparing the prosthesis. Biological failure did not affect the individuals' satisfaction with the prosthesis ($p=0.27$). A possible explanation for this occurrence is that periodontal disease does not present symptoms in the early stages, and as most of the teeth were treated endodontically, they presented no sensitivity to caries.

Periodontal disease, if not treated, causes irreversible consequences such as insertion and bone loss. According to Kourkouta et al. [17] in patients with significant loss of periodontal support, it is preferable to opt for rehabilitation with fixed than removable prosthesis. Furthermore, the fixed restorations provide more comfort and safety, especially in cases in which there was periodontal involvement. According to literature [13], results indicate periodontal involvement as one of the main biological failures. The prostheses hinder the natural stimulation of supporting structures, thus contributing to the accumulation of dental plaque. This plaque accumulation, gingival inflammation, insertion loss, periodontal pockets, and bone loss are possible sequelae in prostheses users [18].

There was statistically significant association between satisfaction degree and technical failure ($p=0.04$). Satisfied patients presented lower failure rate (33.33%), contrasting with dissatisfied patients (66.67%). Even not obtaining association between

radiographic examinations and patient satisfaction, the main failures encountered were short post, bone loss and inadequate endodontic treatment. The short core favors the stress concentration in certain areas, causing the root fracture. The correct length of the core inside the root is synonymous of prosthesis longevity [18].

The longevity of fixed partial dentures depends on many factors ranging from quality until the care with which the patient preserves it. Therefore, monitoring oral hygiene of patients using fixed prosthesis is a powerful tool for the success of this type of rehabilitation. A total of 74% of the interviewees reported no difficulties of prosthesis hygiene. However, (26%) reported not performing proper hygiene because of some difficulties such as unaware of brushing techniques, and no habit of flossing. They claim that when dental floss is used, it wraps in proximal surfaces of and "causes" the bleeding of gingival tissue. Periodontal diseases that affect patients, are often related to bad prosthesis hygiene because of patient's own negligence or, in most instances, due to lack of information about how this cleaning should be performed.

Once it can not be removed, the fixed partial prosthesis requires greater technical ability of patients during cleaning, because food accumulates easily in pontics region and dental materials used retain higher amount of plaque in comparison with enamel or dentin, what favors the constant presence of this irritant factor.¹⁹ In the present study, among patients who had difficulties at the time of cleaning, (56%) stated they did not know anything about oral hygiene instructions. Regarding flossing, (43%) do not use dental floss or even devices such as "thread guides". From a periodontal perspective, the pontics of fixed prostheses represent a serious problem in relation to hygiene and should

be made following some principles for proper hygiene, through methods that eliminate biofilms [8].

Another tool that aids in proper oral hygiene is the periodic controls after finishing prosthetic treatment. However, this fact was not observed in patients from the current study, because from 62 interviewees, (80%) reported not having been informed about the necessity of periodic returns.

Thus, whatever the variables of prosthodontic treatment (single prostheses, or adhesive or multiple fixed prostheses), the planning of periodical controls and periodontal health, serve as a foundation for prosthesis longevity.

CONCLUSION

Based on the results, it was concluded that: after one year of prosthesis installation, patients were satisfied; the satisfaction degree was influenced mainly by technical failures; the main technical failures detected were crown cementation fault and ceramic fracture; the most relevant biological failures were gingival recession followed by periodontal pocket; the main radiographic failures were the preparation and installation of short intraradicular post with increased diameter and cervical misfit of the crown.

Collaborators

AC ZAVANELLI and JVQ MAZARO participated in the elaboration, development of the research and writing the article. PI NÓBREGA was responsible for the experimental phase (data collection, sample selection, review of the literature). R M FALCÓN-ANTENUCCI and RA ZAVANELLI were responsible for analysis of the results, estatistical analysis and writing the article.

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