Patient Attendance in a Recall Program After Prosthodontic Rehabilitation: A 5-Year Follow-up

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Purpose: This study evaluated the recall attendance and maintenance for a patient population after prosthodontic treatment in undergraduate student courses. ***Materials and Methods:*** Four hundred ninety-three patients who received fixed restorations (FRs; crowns or fixed partial dentures) or removable partial dentures (RPDs; conical crown-retained or precision attachment–retained dental prostheses) were included in a recall program. The number of patients attending regularly scheduled follow-up visits every 6 months was recorded. On the basis of the complexity of the performed treatment, all follow-up interventions were assigned to the categories minimal, moderate, or extensive. ***Results:*** After 60 months, a cumulative follow-up attendance rate between 63% (RPD) and 74% (FR) was evident and not gender related. Altogether, 399 patients (193 FR, 206 RPD) regularly attended the follow-up visits. Between 61.9% (RPD) and 93.8% (FR) of these patients did not need any extensive treatment; however, only 19.2% (RPD) to 85.6% (FR) did not need any moderate or extensive treatment between follow-up visits. ***Conclusions:*** Patients treated with FRs showed a higher recall attendance than patients treated with RPDs. Further, patients with RPDs needed more extensive and moderate treatments than patients with FRs. This difference should be taken into consideration during prosthetic planning and patient consultation. *Int J Prosthodont 2012;25:491–496.*

Several studies have assumed that a recall program has a positive influence on prosthodontically or periodontally treated patients. Through a recall program performed on a regular basis, prosthodontic or periodontal treatment outcomes can be maintained for a long time. Remotivation and reinstruction of patients and the immediate treatment of biologic or technical problems seems to be required to preserve teeth or prosthodontic restorations.[1–9] Nevertheless, few studies[10–12] have investigated the recall attendance of patients who received prosthodontic treatments. A prospective study[11] determined the recall interval in 75 prosthodontically treated patients and showed a dropout rate of 64% after 4 years. When the recall interval was 3 months, plaque and bleeding indices were significantly lower than those with a longer recall interval. Another study[10] evaluating removable partial dentures (RPDs) showed a regular recall attendance of less than 50%. Follow-up visits were performed every 6 months for 2 to 3 years after insertion of the prostheses. Based on these findings, the authors recommended more frequent follow-up visits of every 3 months. However, a retrospective study[12] of 1,036 patients treated with RPDs showed a recall attendance of 72% after 8 years, with recalls performed at 6-month intervals.

To counteract the high dropout rate reported, the following standardized procedure was established in the undergraduate student recall program at the Department of Prosthodontics, Propaedeutics, and Dental Materials, Christian-Albrechts University, Kiel, Germany. A computer database was used for the organization of all prosthodontically treated patients and their appointments in the student recall program. Students pledged to contact any patients assigned to them for a recall appointment. The recall appointment, which lasted approximately 90 minutes,

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included dental, periodontal, and functional examinations. This was followed by professional tooth cleaning and, if necessary, deep scaling and root planing. Furthermore, all patients were remotivated and reinstructed about their oral hygiene.

Several authors have shown that prosthodontic restorations can be maintained longer in patients attending a recall program.[6,13,14] Nevertheless, patient motivation in attending the recall program decreases over time.[15] To the authors' knowledge, there is no time-related analysis (eg, Kaplan-Meier analysis) relating specifically to the recall behavior of prosthodontically treated patients and the complexity of the follow-up treatment in the literature. Therefore, the aim of this retrospective study was to analyze the recall attendance of patients after prosthodontic treatment and the complexity of the performed follow-up treatments. The null hypothesis was that patients treated with fixed prosthetic restorations and those treated with RPDs would show no differences in the number and complexity of follow-up treatments.

Materials and Methods

Four hundred ninety-three patients attending the Department of Prosthodontics, Propaedeutics, and Dental Materials received fixed prosthetic restorations (FRs; crowns or fixed dental prostheses) or RPDs (conical crown–retained or precision attachment–retained prostheses). Each patient signed an informed consent form. The restorations were made by undergraduate students under the supervision of faculty members to ensure quality.

If a patient had been fitted with several restorations, only one restoration was monitored to obtain independent samples. In patients who had been restored with FRs or RPDs in both the maxilla and mandible, the RPD was assessed. In patients restored with RPDs in both arches, the restoration with the most abutment teeth was assessed. When the same number of abutment teeth was used in the maxilla and mandible, a random choice was made as to which restoration was to be assessed. In patients restored with several FRs, the FR with the most units was assessed.

Database

After insertion of the prosthodontic restorations, patient data were entered into an Access database (Access 97, Microsoft) specially developed for the recall program. By integrating this data, it was possible to generate verification forms for the treatment of recall patients. Approximately 7 to 10 recall patients were treated per student each semester.

Examination Procedures

Recalls were performed every 6 months. Every patient was contacted up to four times to schedule a date for the recall appointment. The examination, which lasted approximately 90 minutes, included a general and specific anamnesis as well as dental, periodontal, and functional examinations. This information was documented on a specially developed follow-up examination form.[16] Any treatment required was carried out within the student course. Furthermore, every patient was remotivated and reinstructed about his or her oral hygiene.

Patient Attendance

Patients were divided into two groups: those who regularly attended the recall program (recall group) and those who had not taken part in the recall program for more than 18 months (dropout group). During this study, dropout patients were contacted by telephone or mail to determine their reasons for noncompliance. The following questions were asked: "Why don't you take part in the recall program?" and "Have you been treated further by your home dentist?" If no response was provided, researchers noted that the patient could not be contacted for unknown reasons or was deceased (if so informed).

Analysis of Follow-up Treatment

On the basis of the performed treatments, all interventions were recorded in a database. Further, for a qualitative analysis, all interventions were assigned to three different categories of follow-up treatment (Table 1): minimal, moderate, or extensive. This categorization was based on the classification of Studer et al[17] and has been modified previously.[18]

Statistical Evaluation

The observation period for the restorations began at the date of insertion, determined by the patient's records, and ended with the date of the last follow-up visit. If a patient was defined as a dropout, the point of dropout was set as the last attended recall session.

If a patient had been restored with several restorations, only one restoration was monitored to obtain independent samples.

Attendance rates of all patients were calculated according to the nonparametric survival method of Kaplan and Meier.[19] Only the recall group was analyzed quantitatively. Therefore, only the earliest-performed treatment of the worst category was used

Table 1 Categories of Follow-up Treatment According to Complexity*

Treatment	Teeth	FR	RPD
Minimal	Tooth cleaning Scaling	Occlusal adjustments	Relining Treatment of denture sores Change of plastic insert (attachment)
Moderate	Root planing/periodontitis therapy Filling treatment Endodontic treatment	Restoration recemented Post recemented Facing repaired/renewed	Facing renewed Repair of frameworks or minor connectors Renewal of acrylic resin teeth Repair of denture base
Extensive	Extraction Fracture Fabrication of a post and core	Remake	Remake

FR = fixed restoration; RPD = removable partial denture.
*Based on the classification of Studer et al.[17]

Table 2 Types of Restorations Evaluated

Group	Type of restoration	Subgroups	Maxilla	Mandible	Total (%)
FR	Crown		67	56	123 (52)
	FPD	3 units	32	34	66 (28)
		4 units	16	12	28 (8)
		5 units	6	7	13 (6)
		6 units	3	2	5 (2)
	Total (%)		124 (53)	111 (47)	235 (100)
RPD	Conical crown–retained prostheses	One point	10	8	18 (7)
		Linear	48	40	88 (34)
		Triangular	48	42	90 (35)
		Quadrangular	17	15	32 (12)
	Precision attachment–retained prostheses		16	14	30 (12)
	Total (%)		139 (54)	119 (46)	258 (100)

FR = fixed restoration; RPD = removable partial denture; FPD = fixed partial denture.

for the analysis. For Kaplan-Meier analyses, only extensive follow-up treatment and extensive plus moderate follow-up treatment were used as censored events in the first and second analyses, respectively. Statistical analysis was performed using the log-rank test. The significance level was set to $\alpha = 5\%$.

Results

Patient Population and Monitored Restorations

The mean age of the 493 patients (men: n = 228, 46.2%; women: n = 265, 53.8%) at the time of restoration treatment was 58.7 ± 12.1 years, and 264 patients were older than 60 years (53.6%). In total, 2,055 abutment teeth were treated; 1,090 abutment teeth (53%) were located in the maxilla and 965 in the mandible (47%). Details of the types and locations of monitored restorations are listed in Table 2.

Recall Attendance

Of the 493 patients, 399 (193 FR, 206 RPD) attended a regular recall appointment every 6 months; 94 patients did not participate in the recall program, resulting in a dropout rate of 19%. In the first 12 months, almost all patients appeared regularly at the follow-up visits (Fig 1). After 60 months, the cumulative attendance rate was significant higher for the FR group (73.8%) than the RPD group (63%; $P = .02$, log-rank test). Regarding sex, no significant differences were shown ($P > .05$, log-rank test).

Reasons for Noncompliance

The following reasons for noncompliance were obtained from telephone interviews: 28 patients did not have time for or interest in the recall appointment (29.8%), 33 patients were receiving further treatment

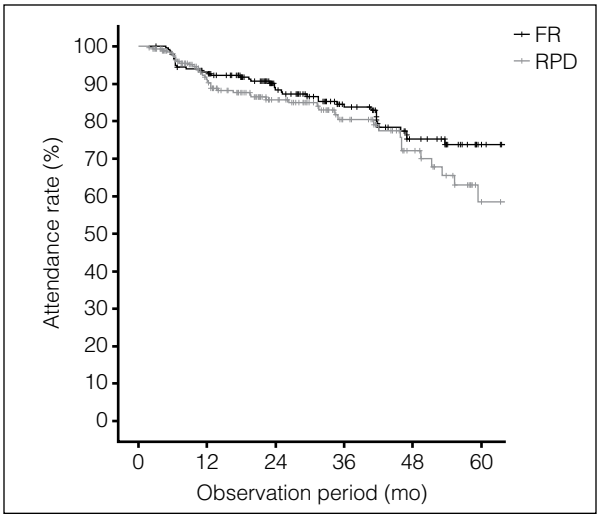

Fig 1 Kaplan-Meier analysis of patient attendance at follow-up visits after prosthodontic rehabilitation. Differences between the FR group (n = 235) and RPD group (n = 258) were significant (P = .02, log-rank test).

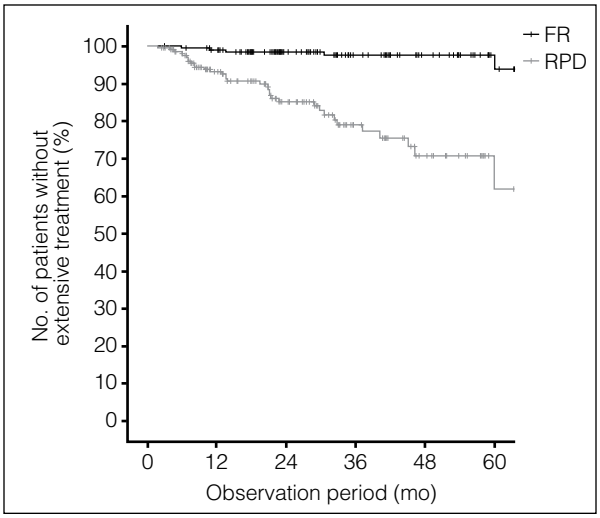

Fig 2 Cumulative rate for extensive treatment. Differences between FRs (n = 193) and RPDs (n = 206) were significant (P = .0001, log-rank test).

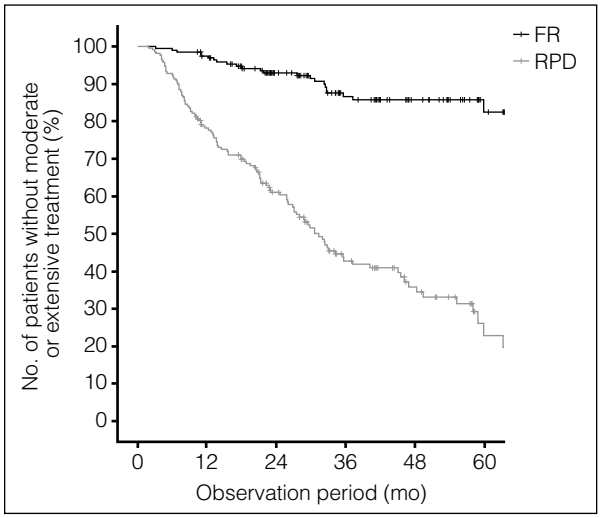

Fig 3 Cumulative rate for moderate or extensive treatment. Differences between FRs (n = 193) and RPDs (n = 206) were significant (P = .0001, log-rank test).

from their family dentists (35.1%), and 29 patients could not be contacted either by mail or telephone (30.8%). Four patients had passed away (4.3%).

Qualitative Analysis of Follow-up Treatment

The results of 399 patients who regularly attended recall appointments were entered in this analysis. For the FR group (n = 193), the mean observation period was 40.7 ± 17.5 months (median: 37.3 months), and for the RPD group (n = 206), it was 37.8 ± 6.4 months (median: 39.8 months).

The complexity of the performed follow-up treatment and its development over time is shown in the Kaplan-Meier analyses in Figs 2 and 3. Figure 2 shows the cumulative rate for extensive treatment. After 5 years, the percentage of patients without extensive treatment was 93.8% (FR) and 61.9% (RPD). Figure 3 shows the cumulative rate for moderate or extensive treatment. After 5 years, the percentage of patients without moderate or extensive treatment was 85.6% (FR) and 19.2% (RPD). Differences between groups were statistically significant (P = .0001, log-rank test).

Discussion

This retrospective study showed a cumulative follow-up attendance rate between 63% (RPD) and 74% (FR) after 60 months. Between 61.9% (RPD) and 93.8% (FR) of all patients did not need any extensive treatment; however, only 19.2% (RPD) to 85.6% (FR) of all patients did not need any moderate or extensive treatment during follow-up visits.

In comparison with the published findings, the follow-up attendance rate in this study was rather high. In other clinical studies, only 50% of patients participated in the recalls.[6,15,20,21] If no recall program was offered, the rate of patients' recall visits was even lower.[15,21–24] On the other hand, a retrospective study on survival rates of clasp-retained partial dentures showed a dropout rate of 28% after a mean observation period of 8 years and is therefore comparable to this study.[12]

The standardized procedure followed may be one reason for the high attendance rate in this study. For

many patients, it was important to ensure that their restoration would last for a long time since they had invested a great amount of time in the student course on treatment and fabrication of their prosthetic restoration. Patients were therefore closely linked to the department of prosthodontics. Follow-up visits even became a matter of routine for many patients, probably because of the relatively short intervals.

Noncompliance was significantly higher in the RPD group than in the FR group. In general, reasons for noncompliance were no time for or interest in the recall appointment (29.8%) and receiving further treatment from family dentists (35.1%). However, these data should be interpreted with caution because the opinions are based only on a telephone interview and were not followed with a clinical examination. In this context, it is a well-known bias that people mask potential dissatisfaction behind answers such as "no time or no interest." The general higher treatment rate in the RPD group may therefore lead to a higher dissatisfaction rate in this group of patients, which is followed by a higher noncompliance rate in this group. Another explanation might be that older patients who received RPDs for prosthodontic restorations chose to be treated by their family dentists to reduce traveling distances.

According to the treatments performed during follow-up, patients with RPDs needed more extensive and moderate treatments than patients with FRs. Therefore, the results confirm the findings of a review article[25] that reported a general agreement in studies that patients with RPDs showed a greater incidence of plaque accumulation, caries, gingivitis, and periodontitis and required more follow-up treatment than patients with FRs. However, focusing on the technical aspect of treatment, RPDs have more possibilities of complications than FRs since an RPD has more wear parts and is removable and therefore more susceptible to mishandling or accidents (eg, falling in the sink during cleaning). Further, the acrylic resin teeth are not as stable as natural teeth or metal-ceramic restorations and can be abraded more easily.[26] However, another reason for the higher complication rate in the RPD group could be that regular frequent recall appointments ensured that small defects were detected in the recall program. Patients often did not notice these defects or were not troubled by them. These defects included secondary caries at the abutment tooth, fracture of facings or abraded occlusal surfaces, and relining. Consequently, restorations should not be described as poor simply because moderate or extensive follow-up treatment was required. In this context, Wöstmann et al[27] reported that in a group of patients restored with RPDs with a single-piece cast framework who regularly participated in a recall program, the survival rate was 10% to 15% lower than in comparable follow-up examinations involving unmonitored restorations. They concluded that follow-up procedures are carried out more often on regularly monitored restorations than on unmonitored restorations. In the long run, these regular adjustments should help maintain oral health. Other studies reported that the majority of patients with unmonitored restorations required extensive oral treatment after a few years. In some cases, the restoration had even become nonfunctional and had accelerated deterioration of the residual dentition.[28]

Finally, it must be pointed out that all clinical treatments were performed by undergraduate students. Even if they were supervised by experienced faculty members, the failure rate during their clinical work may be higher than the work of an experienced clinician. This has to be taken into account when transferring the data of this study to daily clinical practice.

Nevertheless, the difference between RPDs and FRs should be taken into consideration during prosthetic planning and patient consultation. This applies in particular to informing patients of possible alternatives in the designs of FRs and RPDs. Similar conclusions were drawn in a review article.[29]

Conclusions

Computer-aided organization of follow-up visits, repeated contact and motivation of the patients by students, follow-up appointments every 6 months, and an intensive examination ensured that the recall attendance was very high. However, after 60 months, patients treated with FRs showed a higher recall attendance than patients treated with RPDs. According to the treatments performed during follow-up, patients with RPDs needed more extensive and moderate treatments than patients with FRs. This difference should be taken into consideration during prosthetic planning and patient consultation.

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Literature Abstract

Number of teeth and fatigue in older adults

This study had two aims: to investigate whether tooth loss at the age of 70 is cross-sectionally linked to fatigue in a nondisabled community population and whether it is linked to the onset of fatigue longitudinally at 5-, 10-, and 15-year follow-up examinations. Five hundred seventy-three nondisabled 70-year-old participants from a community population in Copenhagen were involved in this study, with baseline measurements made in 1984. Participants were interviewed and underwent medical and oral examinations. The Avlund Mobility-Tiredness Scale was used to measure fatigue. The number of teeth (0, 1 to 9, 10 to 19, or ≥ 20) was used to measure oral health. Covariates consisted of sex, education, income, comorbidity, and smoking. Using bivariate logistic regression analyses, significant cross-sectional and longitudinal associations were found between the number of teeth at age 70 and the onset of fatigue at 5- and 10- but not 15-year follow-up examinations. However, the associations were attenuated when socioeconomic status and smoking were factored in. The authors concluded that tooth loss may be an early indicator of frailty.

Avlund K, Schultz-Larsen K, Christiansen N, Holm-Pedersen P. *J Am Geriatr Soc* 2011;59:1459–1464. **References:** 39. **Reprints:** Dr Kirsten Avlund, Professor, Section of Social Medicine, Department of Public Health, University of Copenhagen, Oster Farimagsgade 5, P.O.Box 2099, DK-1014 Copenhagen K, Denmark. Email: K.Avlund@socmed.ku.dk—*Sapphire Gan, Singapore*