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Complete and partial removable dental prosthesis: a retrospective analysis of pre- and post-installation events

Próteses total e parcial removíveis: uma análise retrospectiva de eventos pré e pós instalação

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ABSTRACT
To compare the number of consultations, manufacturing process, and adaptation time in patients who had complete (CD) and removable partial denture (RPD). A retrospective study evaluated 56 medical records of patients treated at a university dental clinic between 2020 and 2022. A mean of 7.8 and 5.2 consultations were required for manufacturing and complete adaptation of CD and RPD ($p < 0,05$). The use of antidiabetics was associated with longer prosthesis adaptation time ($r = 0.3$; $p = 0.02$). Patients with RPD showed higher need for periodontal (odds ratio [OR] = 13.81; $p < 0.001$) and restorative (OR = 7.88; $p = 0.007$) treatments before prosthesis installation. CD demands a greater number of consultations, and antidiabetics may increase prosthesis adaptation time.

Keywords: Denture, Partial. Dental Prosthesis. Prosthodontics.

RESUMO
Comparar número de consultas e tempo de adaptação em pacientes com próteses totais (PT) e parciais removíveis (PPR). Estudo retrospectivo de 56 prontuários de pacientes atendidos em clínica odontológica universitária entre 2020 e 2022. Uma média de 7,8 e 5,2 consultas, ($p<0,05$), foram necessárias para confeccionar PT e PPR. O uso de antidiabéticos teve associação com maior tempo de adaptação ($r=0,3;p=0,02$). Pacientes com PPR apresentaram maior necessidade por tratamentos periodontal ($OR=13,81;p<0,001$) e restaurador ($OR=7,88;p=0,007$). PT demanda mais consultas para conclusão e antidiabéticos podem aumentar o tempo de adaptação.

Palavras-chave: Prótese parcial removível. Prótese dentária. Prostodontia.

INTRODUCTION

Edentulism, the loss of all teeth, is a health problem affecting many individuals worldwide.[1] In China, Russia, South Africa, Ghana, and Mexico, 11% of the population aged ≥ 50 years have edentulism. Nevertheless, in Brazil, this rate reaches 63% in individuals aged > 65 years.[2] Edentulism is associated with physical, emotional, and aesthetic impairments.[3-5] Consequently, rehabilitation treatments are frequently sought.[1]

Oral rehabilitation with removable dental prosthesis requires a complex procedure and may have unpredictable results. Several consultations are necessary before and after the prosthesis installation.[6-9] Complete dentures (CD) and removable partial dentures (RPD) have different specificities that can influence the number of consultations and prosthesis adaptation time.[7] Furthermore, periodontics and surgery may be necessary before manufacturing the prosthesis.[10] To avoid unrealistic expectations from patients and raise awareness about the chosen treatment, all relevant information (number of consultations, durations of treatment, mean time for complete adaptation, need for supplemental treatments) must be clarified in the first consultation.[11,12]

The number of consultations after the prosthesis installation is an important indicator of adaptation to the treatment[13] or dropout.[9] D'Souza et al (2023) identified that patients with RPD require one to three consultations to adapt completely after prosthesis installation. However, this study did not analyze patients with CD, hindering extrapolation of the results.[9] In contrast, Sadr et al (2011) studied only patients with CD and identified that four to six consultations were necessary for maxillary and mandibular adaptations.[6] Lastly, Panek et al (2006) evaluating individuals with different prostheses combinations identified that those who used CD and RPD simultaneously had more difficulty in the adaptation, requiring a greater number of consultations.[13] The lack of consensus on this topic justifies further investigation.

The associated factors during the adaptation phase following removable prosthesis are also controversial in the literature. The results of the studies above did not reach a consensus regarding the association between sex, age, presence of chronic disease, use of medications, and the adaptation time required by removable prosthesis. [8,13-15]

Considering the high prevalence of edentulism in Brazil, its associated comorbidities, and the importance of prosthetic rehabilitation treatments, the present study aimed to compare the number of consultations and the time required to manufacture and adapt to CD and RPD and identify associated factors to the adaptation of prosthesis.

METHODOLOGY

This study was approved by the research ethics committee (CAAE: 65649922.5.0000.5539) and is reported according to the STROBE guidelines.[16] A retrospective observational analysis of medical records was performed including data from patients seen by university students enrolled in a paper called Removable Prostheses in the city of Maringá/PR. Patients with CD, RPD, or both in at least one arc, installed between 2020 and 2022, were included in the study. The exclusion criteria were lack of relevant clinical data in the medical records. The treatment flowchart adopted by the university paper is shown in Figure 1.

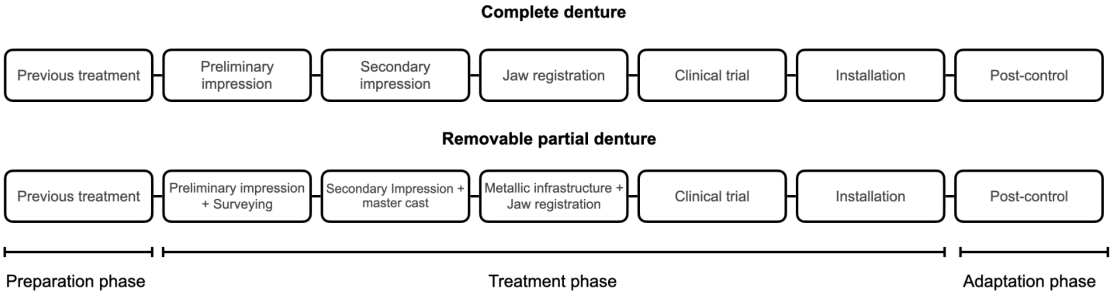

Figure 1. Removable prostheses treatment flowchart.

The sample size was calculated using data from 10 medical records obtained in a pilot study. The final sample also included these medical records. For a priori test power of 80% and a type I error of 5%, 56 clinical records were needed to identify differences between the number of consultations and treatment duration, pre- and post-installation (unpaired groups).

Two researchers (TRH and JVZ) collected data, supervised by a third (RIR). The variables were classified as grouping and outcome. The grouping variables were sex, age, disease, medication use, smoking, type of dental prosthesis, and arch involved (maxilla, mandible, or both). The outcome variables were the number of consultations and treatment time from molding to installation and the number of consultations and adaptation time after installation until complete adaptation. Treatment duration and the number of consultations were also considered predictors to evaluate the relationship between treatment duration and the number of adaptation consultations.

As the same patient could have received CD and RPD, groups were formed with possible combinations: upper and lower CD (UCD/LCD), upper CD and lower RPD (UCD/LRPD), upper CD and lower tooth (UCD/LT), upper and lower RPD (URPD/LRPD) and upper RPD and lower tooth (URPD/LT). Groups with exclusively CD or RPD were also analyzed. Finally, the prostheses were grouped according to their type of support, being muco-supported (MS), tooth-supported (TS), or both, muco and tooth supported (MTS). This analysis tested the null hypothesis that the type of support did not influence the prosthesis adaptation time.

The combined (UCD, LCD, URPD, LRPD, LT) and support type groups (MS, TS, MTS) were analyzed using the analysis of variance (ANOVA), multiple comparisons test (Tukey test), and Bonferroni correction. A comparison of prosthesis groups (CD versus RPD) was performed using the Mann-Whitney test. The association analysis between grouping and outcome variables was performed using correlation tests (Pearson, Spearman, and chi-square). All numerical variables were analyzed for their normality and homoscedasticity. The significance level adopted was 95% ($p < 0.05$). Sample calculation and power were performed using G*Power (version 3.1.9.6), and statistical analyses were performed using Jamovi (version 2.3.21.0) and Past4 (version 4.13).

RESULTS

The sample characteristics are detailed in Table 1. The medical records of 56 patients were analyzed (reporting data from 38 UCD, 18 LCD, 18 URPD, and 21 LRPD). Participants were distributed in the following groups: UCD/LCD (n = 18), UCD/LRPD (n = 9), UCD/LT (n = 12), URPD/LRPD (n = 12), and URPD/LT (n = 6).

Table 1. Characteristics of the sample

	N	(%)
N	56	100
Age (mean ± SD*)	63.7 ± 10.45	-
Married	19	33.9
Single	13	23.2
Divorced	2	3.6
Widowed	7	12.5
Undergoing medical treatment	14	25
Continuous medication use	32	57.1
Self-declared illness (n = 28)		
Hypertension	18	32
Diabetes	13	23.2
Respiratory disease	6	10.7
Heart disease	5	8.9
Neurological disease	5	8.9
Medication in use		
Antihypertensive	17	30.4
Hormone replacement	8	14.3
Antidiabetic	7	12.5
Diuretic	5	8.9
Antidepressant	4	7.1

* Standard deviation.

Regarding the number of consultations and treatment duration, the groups UCD/LCD and URPD/LRPD significantly differed regarding the number of treatment consultations ($p = 0.03$; Cohen's $d = 1.17$; $1- \geq 0.8$). Therefore, statistical differences were observed between the groups with exclusively CD and RPD. The CD group (n = 30 patients) had more consultations. When the groups were analyzed according to the support type (MS, TS and MTS, n = 39 patients) , a statistical difference was identified in the number of consultations, also ($p > 0.001$; Cohen's $d = 1.48$, 95% confidence interval [CI] 0.65 to 2.31), between MS and TS groups. The MS

group had the highest number of consultations, and no differences were observed with the MTS group. When exclusively comparing the types of prosthesis with a test power *a posteriori* > 80%, CD required more treatment (p > 0.001; biserial correlation 0.59) and follow-up consultations (p = 0.046; biserial correlation 0.31) compared to RPD. Table 2 shows the detailed results, except for the combined groups.

Table 2. Number of consultations, treatment and follow-up duration, according to the types of prosthesis and prosthesis support.

	N (%)	Treatment consultations Mean ± SD	Treatment duration (in days) Median (IR)	Follow-up consultations Median (IR)	Follow-up duration (in days) Median (IR)
Prosthesis					
CD	30 (63)	7.83 ± 2.28 †	79.50 (36.50)	0.5 (1.75) §	0 (14)
RPD	17 (36)	5.41 ± 1.66 †	70 (33)	0 (0) §	0 (0)
p	-	< 0.001	0.182	0.046	0.111
Types of prosthesis support					
MS	30 (63)	7.83 ± 2.28 §	79.50 (36.50)	0.5 (1.75)	0 (14)
TS	9 (19)	4.78 ± 1.39 §	55 (24)	0 (1)	0 (7)
MTS	8 (17)	6.13 ± 1.73	82.50 (35)	0 (0)	0 (0)
p	-	0.001	0.128	0.136	0.362

SD: standard deviation; IR: interquartile range; CRDP: complete removable dental prosthesis; PRDP: partial removable dental prosthesis; MS: muco-supported; TS: tooth-supported; MTS: muco-tooth-supported.

† Mann-Whitney test; § ANOVA with Bonferroni correction.

Regarding associated factors, a positive association was identified between the use of antidiabetics, the number of consultations, and treatment duration (r = 0.3; p = 0.02; 1-β ≥ 0.8). No significant association (p > 0.05) was identified between the number of treatment and follow-up consultations with the following variables: sex, age, smoking, continuous use of medication, hypertension, diabetes, respiratory, heart, and neurological issues, use of antihypertensive, hormone replacement therapy, use of diuretics and use of antidepressants.

The pre-prosthetic treatments performed are described in Table 3. Periodontal (p < 0.001; OR = 13.81, 95% CI 2.39 to 53.12) and restorative (p = 0.007; OR = 7.88, 95% CI 1.51 to 41.03) treatments were significantly associated with RPD.

Table 3. Distribution of pre-prosthetic procedures performed according to combinations of removable prostheses.

	UCD/LCD	UCD/LRPD	UCD/LT	URPD/LRPD	URPD/LT
	N (%)	N (%)	N (%)	N (%)	N (%)
Periodontics	0 (0)	2	1	2	2
Dentistry	0 (0)	0 (0)	0 (0)	0 (0)	2
Surgical	3	0 (0)	0 (0)	1	1
Periodontics + Dentistry	2	0 (0)	0 (0)	1	0 (0)
Periodontics + Surgical	2	3	2	1	0 (0)
Periodontics + Dentistry + Surgical	4	4	0 (0)	1	0 (0)
Periodontics + Dentistry + Surgical + Endodontics	0 (0)	1	0 (0)	0	0 (0)
Total	11 (100)	6 (100)	3 (100)	6 (100)	5 (100)

UCD: upper complete dentures; LCD: lower complete dentures; URPD: upper removable partial dentures; LRPD: lower removable partial dentures; LT: lower toothed

DISCUSSION

The present study investigated the differences between complete and partial dentures, concerning the manufacturing and adaptation time. CD required more time than RPD for manufacturing and prosthesis adaptation. A positive association was also observed between the use of antidiabetics and longer prosthesis adaptation time, for both, complete and partial prosthesis. Finally, patients with RPD showed a higher need for periodontal and restorative treatment before prosthesis installation.

According to the medical records, all patients were older than 60 years and mostly women, which is expected since the need for dental prostheses increases significantly with age.[2] Other studies suggest that women are more attentive to health-related issues.[14,15] However, age and sex were not associated with the prosthesis adaptation time or a higher prevalence of previous treatment.

Poljak-Guberina et al (2022) studied 60 patients with CD for five years.[15] They showed that women adapted more easily than men to prostheses in the first 15 days, but no difference was observed after this period. Contrarily, Panek et al. (2006) followed 300 patients with CD and RPD and observed that men adapted faster than women.[13] Although there is no consensus in the literature about gender and tolerance with the prosthesis, men and women require post-installation consultations.

Most patients declared having some illness, using medications continuously, or both, with hypertension and antihypertensives the most prevalent. However, no disease was associated with prosthesis manufacturing and adaptation time. Only antidiabetics medication was associated with the number of consultations and adaptation time. We found an association between diabetics and the use of antidiabetics, but not between diabetics and prosthesis adaptation time. Several studies report oral manifestations caused by diabetes,[17-19], but not by antidiabetic medication. Therefore, our findings must be interpreted with caution.

No significant association was identified between study variables and other medications, which can be explained by the small sample size required for this study design. Only the use of diuretics presented retrospective test power above 80%, confirming the absence of correlation between variables. New studies including larger samples are relevant.

No information about the salivary flow was found in the medical records. Antihyperten-

sives and nervous system medications reduce salivary flow, consequently increasing the frequency of ulceration in the tissues supporting removable prostheses.[20] Furthermore, ulceration can also lead to difficulties in speaking and chewing, especially in older adults.[21] So, the present study highlighted the importance of posterior control in elder patients treated with removable prostheses.

According to the results, it is suggested that most patients with dental prostheses may have some illness, use medication, or both, which does not contraindicate prosthetic treatment. However, the knowledge of possible adverse reactions related to specific illness or medication may influence the treatment plan and prognosis.

The treatment duration of patients with CD took an average of 2.5 more consultations than for those with RPD. This difference can be justified by (1) in TS prostheses, the absence of secondary impression; (2) in MTS prostheses, the secondary impression must be performed at the same stage as the clinical trial; and (3) secondary impression for CD was performed in more than one session when both arches were involved. In contrast, the total treatment duration did not differ and ranged from 66 to 90 days. The metallic infrastructure of RPD requires more time to be completed, which is valuable information for dentists and patients. The financial planning of a treatment should also consider the time needed for its completion.[22]

Another important aspect that was not considered in this study is the time needed to prepare the supporting tissues to receive RPD, such as dental biofilm control, restorative, endodontic, and surgical procedures. For standardization purposes, we considered that the treatment duration and number of consultations began at the preliminary molding and ended with the complete prosthesis adaptation. Therefore, the treatment duration of a RPD can be much longer than the observed in this study if previous preparations are considered.

CD had a significantly higher number of consultations after installation than RPD, which can be explained by the fact that CD is exclusively MS, favoring injuries to the underlying tissues. However, RPD with MTS did not present a significant difference compared to RPD with TS. Possibly due to RPD higher stability. Panek et al. (2006) found that patients with CD in the maxilla and mandible adapted faster when compared to those with at least one RPD.[13] Their findings can be explained by the type of RPD used because their prostheses were made exclusively in acrylic and did not have a TS, resulting in a concentration of forces on the alveolar ridge and less stability.[13]

The literature shows that jaw registration and greater professional experience can positively influence the prosthesis adaptation.[7,23] Kimoto et al. (2007) identified that prostheses installed by professionals with more than ten years of experience resulted in fewer treatment consultations and faster adaptation time.[23] Similarly, Keshtgar et al. (2020) identified that jaw registration in RPD resulted in fewer follow-up consultations.[7]

In the present study, students with little or no experience performed all treatment stages and adaptation flow. However, all procedures were supervised by experienced professionals. Jaw registration is essential for any treatment involving removable prostheses. Furthermore, treatment progress does not occur unless the progression criteria for each stage are met. The above mentioned factors may have contributed to the high number of treatment consultations and the low number of adaptation consultations observed in our study.

Patients with RPD were more likely to require periodontal and restorative procedures before prosthetic treatment. According to the latest edition of the National Oral Health Survey, only 1.8% of older adults do not have periodontal issues.[2] Although controlling dental biofilm is extremely important for the longevity of removable partial dentures,[24] the manual dexterity of the individual declines with aging and may negatively impact the self-care to avoid dental biofilm.[25] Furthermore, RPD can influence biofilm accumulation on dental and periodontal structures.[24]

Steele (2001) identified that sugar intake, the use of RPD, and a high plaque index doubles the risk of developing cavities.[26] Thus, periodontal control must be carried out systematically in this population before and after prosthetic treatment.

The large amount of previous restorative treatments among this population can be related to the need to prepare the direct and indirect abutment teeth, which will support the future RPD. Creating niches and guide plans is essential to direct the chewing forces applied to the abutment teeth, stabilize the prosthesis, and promote retention.[27] Nonetheless, the preparation of niches in intact teeth results in a high prevalence of dentin exposure.[28] Strategic restorations are done before niche preparation to avoid this exposure.

The main limitation of this study was the small sample size for secondary aims. Although the sample was sufficient to test the null hypothesis of equality between the number of treatment and adaptation consultations between the CD and RPD groups, the findings must be considered cautiously.

CONCLUSION

CD in the included sample required more consultations and seemed more difficult to adapt than RPD. Nevertheless, RPD requires more periodontal and restorative care before prosthetic treatment. Lastly, antidiabetics negatively influenced the prosthesis adaptation in the included population. However, more studies are needed to confirm this finding.

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