Treatment Outcomes with Removable Partial Dentures: A Retrospective Analysis

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Purpose: This retrospective clinical study aimed to evaluate the long-term outcomes of clasp-retained, metal-framework removable partial dentures (RPDs) and their clasped teeth, the influencing factors on survival, and the type and number of repairs needed during the observation period. ***Materials and Methods:*** The study is based on a convenience sample of 52 patients who received 65 RPDs with a total of 207 clasped teeth. The mean observation period was 3.11 ± 0.29 years (maximum: 10 years). Patient gender, prosthesis location (maxilla/mandible), number and distribution (Kennedy class) of abutment teeth, and impact of a continuous follow-up program on a favorable outcome probability were analyzed. Statistical analysis was performed using the Kaplan-Meier method ($P < .05$) in combination with Cox regression analysis. ***Results:*** During the observation period, 9.2% of the RPDs ceased to function and 5.8% of the abutment teeth were extracted. Mean RPD survival time was 8.07 ± 0.66 years, with a positive outcome probability of 90% after 5 years. Prosthesis location was the only parameter that significantly ($P < .05$) impacted this probability. ***Conclusion:*** Overall, the high survival probability and low extraction rate of the abutment teeth reported in this study indicate that RPDs designed according to hygienic pronciples are clinically successful. *Int J Prosthodont 2013;26:147–150. doi: 10.11607/ijp.2959*

Clasp-retained removable partial dentures (RPDs) with metal frameworks are frequently used in clinical practice. Their advantages include time and cost efficiency for clinicians and patients, while their disadvantages include reduced clinical effectiveness and a higher frequency of repairs.[1–3]

The aim of this retrospective clinical study was to evaluate the long-term outcomes of clasp-retained RPDs and their clasped teeth, the influencing factors on survival, and the type and number of necessary repairs during the observation period. Further, it was analyzed if the RPDs in this study, which were fabricated according to traditional design principles that seek to minimize plaque accumulation (ie, hygienic principles),[4–8] performed better than RPDs in similar studies. These hygienic principles have been summarized by Öwall et al.[8]

Materials and Methods

A convenience sample of 60 patients who received 75 RPDs from 1997 to 2008 were selected for analysis. Eight patients wearing 10 RPDs without complete data sets (inconsistent data or no available postinsertion data) were excluded. Therefore, the ensuing retrospective study included 52 patients (24 women, 28 men; mean age: 59 years; age range: 21 to 86 years) with 65 RPDs (47 mandibular, 18 maxillary; Kennedy Class I: 35, Class II: 21, Class III: 9) with a total of 207 clasped teeth (160 natural teeth, 47 crowned teeth; 180 vital teeth, 27 endodontically treated teeth).

The mean observation time was 3.11 ± 0.29 years (maximum: 10 years); the number of RPDs remaining under observation for each year is shown in Table 1.

The RPDs were provided in the clinical courses of the Department of Prosthodontics, Justus-Liebig-University, Giessen, Germany, under strict supervision of experienced full-time teachers and following a standardized protocol. Calibration sessions

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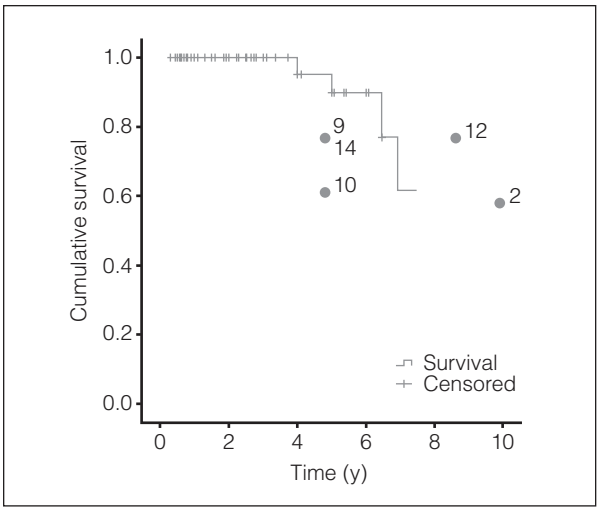

Fig 1 Cumulative survival for all RPDs. The dots represent the survival rates reported by other authors (Table 2).

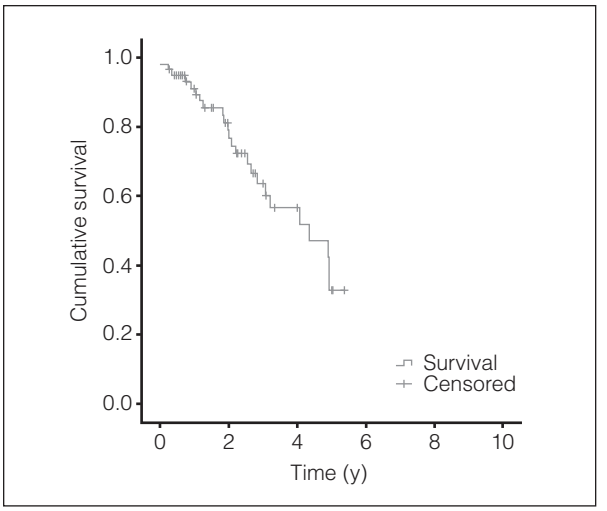

Fig 2 Outcome probability (first repair) for all RPDs.

Table 1 Number of RPDs Under Observation Over Time

	Year									
	1	2	3	4	5	6	7	8	9	10
RPDs	65	49	38	25	18	15	10	4	3	2

for the supervisors were routinely scheduled every 12 months, as required by department guidelines. The study was approved by the university's Ethics Committee (no. 164/11).

Prior to treatment, all patients underwent an oral hygiene program. Preliminary alginate (CA 37, Cavex) impressions were taken for diagnostic casts. The casts were used to design the RPDs. It was considered essential to simplify the denture design to minimize the number of stagnant sites and avoid gingival coverage by the retentive elements and connectors as much as possible.[4–7] All treatment planning was carried out by the authors (PR, PF, and BW). After tooth preparation, alginate (CA 37) impressions were taken. Master casts were poured using vacuum-mixed type IV dental stone (Fujirock, GC). All RPDs were fabricated in one calibrated dental laboratory. After receiving their dentures, all patients were offered the chance to participate in a continuous (annual) follow-up program. Thirty-one patients with 35 RPDs were not interested and thus not included in the follow-up.

The endpoint values selected for a favorable outcome probability were "renewal of prosthesis" and "first repair." In case of clasp fracture, a new clasp was cast and welded to the framework. The indication for relining was based on a test seal molding (criterion: seal thickness), as required by department guidelines. Statistical analysis was performed using the Kaplan-Meier method ($P < .05$) for survival analysis. Survival curves were stopped when fewer than five cases remained at risk.

The variables gender, denture location, number of clasped teeth, distribution of remaining teeth (Kennedy class), and the impact of participation in the follow-up program were analyzed as covariates of the survival function in a Cox regression model.

Results

During the observation period, 9.2% of the RPDs ceased to function, and 5.8% of the abutment teeth were extracted. The mean expected survival time of the RPDs was 8.07 ± 0.66 years; the positive outcome probability after 5 years was 90%. The survival curve is shown in Fig 1.

Mandibular RPDs showed better survival than maxillary RPDs ($P < .05$; Cox regression). The Cox regression analysis revealed no significant impact of any other parameters on the clinical outcomes.

The mean observation time until the first repair was 4.6 ± 0.64 years (Fig 2). Thirty of the 65 RPDs needed at least one repair. More than one repair was necessary in 14 cases; 9 RPDs needed two repairs, 4 needed three repairs, and 1 needed four repairs. The main reasons for repair were relining (n = 23), clasp activation (n = 9), and clasp fracture (n = 6) (Fig 3).

Discussion

After 5 years, the RPDs in this study, which were fabricated according to hygienic principles, showed a

Fig 3 Reasons for repair (n = 50).

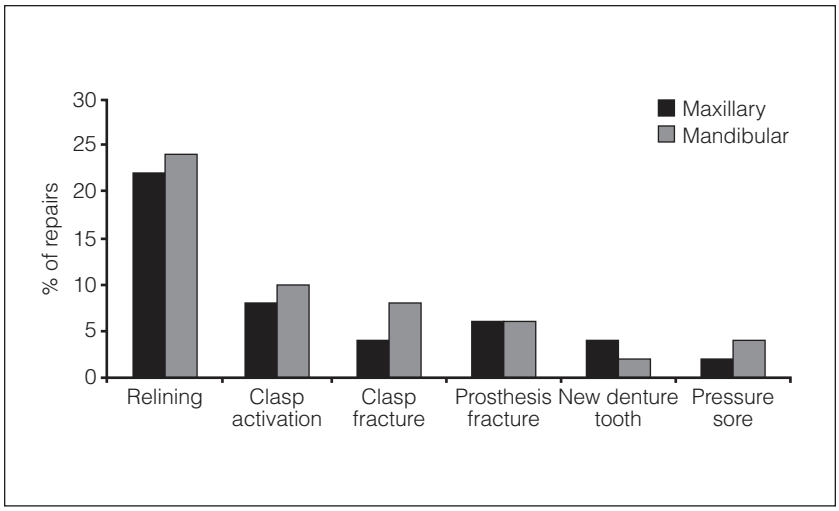

Table 2 Survival Rates Reported in the Literature

Study	Year	Observation period (y)	No. of RPDs	Statistical method	Survival rate
Aquilino et al[9]	2001	5/10	13	Kaplan-Meier	77%/56%
Bergman et al[2]	1982	10	27	Input-output	59%
Bergman et al[3]	1995	25	18	Input-output	65%
Budtz-Jørgensen and Isidor[10]	1990	5	26	Input-output	61.5%
Carlsson et al[11]	1976	13	68	Input-output	34%
Chandler and Brudvik[12]	1984	8–9	44	Input-output	77.3%
Kapur et al[13]	1994	5	122	Input-output	71.3%/76.6%

higher survival rate than clasp-retained prostheses with metal-frameworks in other studies (Table 2). This difference in survival times is even greater than it appears because simple input-output statistics—as applied in most studies—generally overestimate the survival function. This overestimation, in combination with the relatively small number of cases in the study by Chandler and Brudvik,[12] may explain the very high outcome probability after 8 to 9 years reported there. Only Aquilino et al[9] used the more adequate Kaplan-Meier method.

Many authors[2,3,11–13] have emphasized the strong influence of a continuous follow-up program on the clinical outcomes of RPDs. However, to the present authors' knowledge, no real evidence is available on this topic. Though previous studies have reported that clasps have a negative effect on the periodontal condition of abutment teeth,[14,15] it is unclear whether these effects or a patient's participation in an oral hygiene program decisively influence the longevity of an RPD. In this study, no influence of the follow-up program could be identified. It would have been useful to examine the periodontal status of the clasped teeth as well as the presence of caries; however, these data were inconsistently documented and thus could not be included for analysis. This limitation represents one shortcoming of this study.

Patient gender, number of clasped teeth, and Kennedy class showed no significant impact on the clinical outcomes. These results suggests that the configuration of the remaining dentition (except for the location) may be less important regarding the clinical outcome of an RPD than often assumed.

Conclusions

The high survival probability and low extraction rate (5.8%) of the abutment teeth reported in this retrospective review indicate that removable partial dentures designed according to hygienic principles met or exceeded the results reported by similar studies. Prosthesis location (maxilla/mandible) was the only parameter that significantly influenced survival probability.

Acknowledgments

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Literature Abstract

Osseointegrated implant rehabilitation of irradiated oral cancer patients

This retrospective study investigated the survival of a series of osseointegrated implants placed in patients who had received radiotherapy for oral cancers at the Department of Oral and Maxillofacial Surgery, University Hospital La Princesa (Madrid, Spain). A total of 225 implants (MG Osseous-Mozogaru) were placed in 30 patients who had received radiation doses ranging from 50 to 70 Gy as part of the oncologic treatment and had a disease-free survival of at least 12 months. One hundred thrity implants placed in 20 patients with non-irradiated oral cancer served as the control group. All implants were placed by two oral and maxillofacial surgeons. The follow-up period ranged from 6 to 96 months. Survival rates were calculated using Kaplan-Meier survival curves. Differences between groups were compared with a log-rank test. The overall 5-year survival rate in irradiated and non-irradiated patients was 92.6% and 96.5%, respectively. Five patients developed osteoradionecrosis as a complication of radiotherapy. Forty-one implants were placed in these patients once osteoradionecrosis had healed. The 5-year survival rates of implants in the osteoradionecrosis and the non-osteoradionecrosis groups were 48.3% and 92.3%, respectively. The implant losses in irradiated patients mainly presented with peri-implant bone infection or bone loss and subsequent loss of integration. Ninety-three percent of the prostheses fitted were implant-supported while 7% were implant–assisted. The authors concluded that implant rehabilitation in irradiated patients offers an optimal survival rate and is an acceptable option for patients who had suffered from osteoradionecrosis. Complete implant-supported prostheses were recommended after irradiation to provide functional, stable, and esthetically satisfactory rehabilitation. However, more evidence is needed to show their overall benefit in the patient's quality of life.

Mancha de la Plata M, Gías LN, Díez PM, et al. *J Oral Maxillofac Surg* 2012;70:1052–1063. **References:** 39. **Reprints:** Dr Mancha de la Plata, Department of Oral and Maxillofacial Surgery, University Hospital Montepr´ incipe, Avenida de Montepr´ incipe 25, 28660 Madrid, Spain. Email: maria.mancha@yahoo.es—*Teo Juin Wei, Singapore*