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Prognosis of double crown-retained removable dental prostheses compared with clasp-retained removable dental prostheses: A retrospective study

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ABSTRACT

Purpose: The present study compared the clinical prognosis of double crown-retained removable dental prostheses (D-DRPs) with that of clasp-retained removable dental prostheses (C-RDPs).

Methods: Clinical records of 201 patients who had received 52 D-RDPs with 144 abutment teeth (D-teeth) and 199 C-RDPs with 399 abutment teeth (C-teeth) at the Prosthetic Dentistry Clinic in Hokkaido University Hospital between April 2005 and June 2015 were analyzed. Survival and complication probabilities of the two types of prostheses and abutment teeth were evaluated using the Kaplan-Meier method and compared using the log-rank test. Cox regression analysis was used to determine the impact of covariates on abutment teeth survival and complications such as gender, age, type of retainer, Eichner classification, jaw, type of tooth, endodontic therapy performed, type of edentulous space, and presence of opposing teeth.

Results: Statistical analysis showed no significant differences between the two types of prostheses in terms of prostheses survival, prostheses complication, and abutment teeth survival. However, a significant difference was observed for complications of abutment teeth. Decementation was the most frequent cause of failure, which occurred in 76.9% of D-teeth and 28.3% of C-teeth. Patient's age, jaw, endodontic therapy performed, and type of edentulous space affected the survival of abutment teeth, whereas the type of retainer and edentulous space affected complications of abutment teeth.

Conclusion: The prognosis of both types of prostheses was considered to be acceptable. Although D-RDP had lower complication-free rates for abutment teeth, most of the observed complications were decementation, which was considered to be repairable.

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1. Introduction

Double crown- and clasp-retained removable dental prostheses are both well-documented treatment solutions for partially edentulous arches. Double crown-retained removable dental prostheses (D-RDPs) have been clinically proven to be a successful treatment option for partial edentulism [1]. Double crowns have the advantage of improved crown-root ratio of abutment teeth, and facilitate oral hygiene measures by removing prostheses [2]. Furthermore, D-RDPs function for a long period because of their superior strength and ease of repair in case of extraction of abutment teeth [2]. Previous studies reported that the survival rates of D-RDPs and their abutment teeth are high [1,3-5]. On the other hand, the long-term success rate of clasp-retained removable dental prostheses (C-RDPs) which are carefully planned and designed is well known [6-9]. In addition, low failure rate of removable dental prostheses having a modified clasp with rigid design was reported [10]. However, there is no clinical investigation comparing the prognosis of D-RDPs and C-RDPs in a sufficient study cohort [11]. Thus, the objective of the present retrospective study was to assess and compare the prognosis of D-RDPs with C-RDPs from viewpoints of survival and complication-free rates of the prostheses and their abutment teeth.

2. Material and methods

2.1. Study population

We selected partially edentulous patients who had been treated at the Prosthetic Dentistry Clinic in Hokkaido University Hospital from April 2005 to June 2015. Patients who had received D-RDPs or C-RDPs with metal-framework and had been checked at least twice per year were selected. The exclusion criteria included combination of double crown- and clasp-retained prostheses, removable dental prostheses that coexist with dental implants, and maxillofacial prostheses.

2.2. Study design

This retrospective study was based on the clinical records of the patients who met the inclusion and exclusion criteria. From the clinical records, we obtained the patient's age, gender, the number of remaining teeth, the number of teeth that had opposing teeth, Eichner classification, design of prostheses, the state of abutment teeth at date of prostheses insertion. The categories of Eichner classification were combined into three groups: class A-B2, class B3-B4, and class C1-C2.

We classified the abutment teeth adjacent to edentulous space into the following two groups according to the type of RDPs: D-teeth and C-teeth, in D-RDPs and C-RDPs, respectively. Each abutment tooth was also assessed in terms of the type of tooth, endodontic therapy performed, type of adjacent edentulous space, and presence of opposing teeth. The type of adjacent edentulous space was classified into the following two groups: bounded, which have remaining teeth on both

mesial and distal sides; distal extension, which had no remaining teeth at the distal end.

The start of the observation period was defined as the date of prostheses insertion. In the follow-up examinations, attending dentists checked whether technical or biological complications had happened or not. If necessary, appropriate treatment was done. The endpoints of prostheses were replacement or removal of the prostheses because of irreparable breakage and any first complication requiring repair such as damages in retainers, connectors, denture bases, artificial teeth, and remaining teeth. The endpoints of abutment teeth were extraction and first complications requiring treatment such as loss of cementation or fracture of crown restoration, fracture of teeth, caries, periapical disease, and periodontal disease. The periodontal disease as endpoints was defined as tooth mobility or alveolar bone loss which lead to extraction or replacement by root coping.

If no complication was found, the end of the observation period was defined as the date of the most recent oral examination before September 2015. Patients were observed for a maximum of 60 months.

2.3. Statistical analysis

Kaplan-Meier analysis was used to evaluate survival probabilities and complication-free probabilities for prostheses and abutment teeth respectively. The log-rank test was used to show the possible effects of the type of retainer on these values. *p*-Values less than 0.05 were considered to be statistically significant. A multivariate stepwise Cox regression model was used to estimate the influence of the independent variables upon the survival and complications of the abutment teeth, taking multicollinearity into account.

Statistical analyses were performed using JMP[®] 12(SAS Institute Inc., Cary, NC, USA).

The protocol of this study was approved by the Ethics Committee of Hokkaido University Hospital (No. 015-0267).

3. Results

3.1. Study population

Of the 220 patients who met the inclusion criteria, 19 patients were excluded based on the exclusion criteria. Consequently, 201 patients were investigated (Fig. 1). Overall, 51 participants were males, and 150 were females with prostheses consisting of 52 D-RDPs and 199 C-RDPs. The mean observation period was 38.0 ± 20.3 months. There were 36 D-RDPs and 122 C-RDPs with Kennedy class I arches, 11 and 63 with class II arches, 2 and 9 with class III arches, and 3 and 5 with class IV arches, respectively. All prostheses had a transversal framework design and rigid major connector. C-RDPs had sufficient rests, broad bracing arms, and guide plates. The details of each prosthesis are shown in Table 1. Abutment teeth consisted of 144 D-teeth (92 cast conical crowns, 10 resilient telescopic crowns, 42 electroplated double crowns) and 399 C-teeth. The detail of each abutment tooth is shown in Table 2.

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