

Epidemiological Data and Survival Rate of Removable Partial Dentures

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ABSTRACT

Introduction: The use of removable partial denture (RPD) is considered as low-cost and common treatment option to rehabilitate edentulous areas.

Aim: This study aimed to investigate the epidemiological data of patients rehabilitated with removable partial denture (RPD) in order to assess treatment survival rate and failures.

Materials and Methods: Epidemiological data and medical records of patients treated with RPD between 2007 and 2012 at the RPD discipline of a Brazilian University (Aracatuba Dental School- UNESP) were evaluated as well as dental records of patients who underwent RPD treatments (fabrication or repairs) between 2000 and 2010. Factors such as gender, age, presence of systemic disease, main complaint, edentulous arch, period and cause of denture replacement and the prosthesis characteristics were recorded. The chi-square test was used to

assess the differences between the variables and the Kaplan Meyer to assess the survival of the RPDs evaluated.

Results: A total of 324 maxillary RPD and 432 mandibular RPD were fabricated. Most of the patients were women aging 41 to 60-year-old. The number of mandibular RPD Kennedy class I (26%) was statistically higher for the maxillary arch ($p < .05$). There was no association between main complaint to gender or the presence of systemic disease. The lingual plate was the most common major connector used in the mandible (32%). The main reason for altering the design of replaced RPDs were changes during treatment plan.

Conclusion: The number of patients who require RPD is large; most of RPDs are Kennedy Class I. A good treatment plan is very important for achieving a positive treatment outcome, and it is strictly related to the survival rate.

Keywords: Dental prostheses, Kennedy classification, Survival rate

INTRODUCTION

The compromising of patients' oral health may affect their nutritional, physical and mental status, which could impair an active social life [1]. The replacement of missing teeth with dentures improves subjects' quality of life and their personal relationships [2,3]. The use of RPD is considered as low-cost and common treatment option to rehabilitate edentulous areas, and approximately 30% of the adult population wears an RPD [4].

Several factors related to the rehabilitation process and demographic characteristics of patients should be advised at treatment planning [5,6]. Patient's main complaint should meet the characteristics of the rehabilitation treatment. The reestablishment of chewing function and the appearance of the Removable Partial Denture (RPD) are the most important factors for the patients, and due to its subjectivity, it is extremely important to assess patient's expectancy in order to achieve treatment success [6-8].

Some studies have shown that 50% of removable dentures should be replaced after five years of use. The oral health related quality of life (OHRQoL) may change substantially after RPD insertion [6,9]. The increase in stability and retention of new dentures improve the social life and function of several patients. Additionally, the quality of life and the self-perception of oral health can be influenced by the RPD quality [3].

The delay or absence to seek a dental treatment is sometimes justified by the lack of information on the importance of prevention policy or the ideal time between maintenance consults. Less than 50% of patients seek dental treatment in a period of nine years [10]. Maxillary denture replacements are mostly related to dental cavities, loss of supporting teeth, RPD fracture and loss [11,12] while for mandibular denture those are related to periodontal disease, loss of supporting teeth, RPD fracture and wear; also denture fracture is more common than denture relines [13]. Thirty

five percent (35%) of Kennedy class I and II RPDs are relined [14]. Previous information about both oral and systemic conditions of the patient are very important in Dentistry, since several factors can influence the treatment planning [7,8,15]. Some studies highlighted the incidence of edentulism which reflects the lack or failure of dental health care for the population [10,16]. Nevertheless, epidemiological data concerning the characteristics of RPD treatment are scarce in the literature.

Therefore, the current study aimed to evaluate some factors related to treatment planning and survival rates of RPDs at Aracatuba Dental School – UNESP. This Brazilian University attracts many patients each year for different dental treatments, including the rehabilitation with RPDs. The RPD is an intermediate dental treatment to an edentulous situation, therefore its demographic and survival rate data are important to better understand the health care politics.

MATERIALS AND METHODS

This study was set in accordance with the recommendations of the Committee on Ethics in Human Research (Process FOA/11-05671). The medical records of patients treated with RPD between 2000 and 2010 at the RPD discipline of Aracatuba Dental School, Univ Estadual Paulista São Paulo –Brazil (UNESP) were evaluated. Five hundred and thirty six (536) patients were analysed and the following variables were recorded: gender, age, presence of systemic disease (yes or no), main complaint, buccal preparation and denture characteristics.

Inclusion criteria

- Partially edentulous patients, treated in the RPD clinics of the Aracatuba Dental School.

- Temporomandibular disorder asymptomatic subjects confirmed through the research diagnostic criteria (RDC)/temporomandibular disorder (TMD) questionnaire [17].

Exclusion criteria

- Individuals with oral pathologies in soft or hard tissue.
- Presence of oral disease; periodontal problems.

Dental records of patients who had their RPDs replaced with or without changes to the prostheses design, between 2007 and 2012 from the Aracatuba Dental School, Univ Estadual Paulista São Paulo –Brazil (UNESP) were also analysed. Forty six (46) RPDs treatments were investigated and the variables gender, edentulous arch (upper or lower), period of denture wear (in years), changes on the design of the new denture compared to the design of the previous denture and cause of denture replacement were recorded.

The cause of replacement of the RPDs that had their design modified included extraction of the supporting teeth on the free-end area and changes on the connectors and attachment system. For those dentures that maintained the same structure, the causes of replacement were related to denture fracture, time of wear and relining necessity.

STATISTICAL ANALYSIS

The Chi-square test at 5% of significance was used to cross Data among the variables tested and verify the correlations. The survival rate of RPDs was estimated by the Kaplan–Meier method.

RESULTS

From the 756 RPD treatments (536 patients) evaluated between 2000 and 2010, 324 were maxillary dentures while 432 were mandibular dentures. All data were expressed by percentage values, most of the patients were women (64% for maxillary denture and 68% for mandibular denture) aged from 41 to 60-year-old [Table/Fig-1]. The number of mandibular RPD Kennedy class I (26%) was statistically higher for the maxillary arch ($\chi^2 = 52.2848$, $p < .0001$). There was a strong association between main complaint and Kennedy class classification (I, II and III) ($\chi^2 = 12.1620$, $p = .0162$; $\chi^2 = 13.0440$, $p = .0111$, for maxillary and mandibular arches respectively) [Table/Fig-2].

The patients' main complaint was to replace the old denture, for maxillary denture (43%) in which 25% were Kennedy class III. In the mandibular arch, most of the patients were concerned about the aesthetic results (17% of Kennedy class I and II).

Age (years)	Maxilla			Mandible		
	Female	Male	Total	Female	Male	Total
21 - 40	9	3	13	7	3	10
41 - 50	17	13	30	20	8	28
51 - 60	24	9	33	25	9	34
61 - 70	10	8	18	13	8	21
71 - 90	3	3	6	3	3	6
Total	64	36	100	68	32	100

[Table/Fig-1]: Percentage distribution of RPDs according to age and gender.

Kennedy classification	Maxilla	Mandible	Total
I	7	26	33
II	14	17	31
III	17	15	32
IV	3	1	4
Total	41	59	100

[Table/Fig-2]: Percentage distribution of RPDs according to Kennedy classification and edentulous arch. Chi-square ($\chi^2 = 52.2848$ ($p < .0001$)).

Additionally, strong association was observed between the impression technique and Kennedy classification (I, II and III) for both maxillary and mandibular arches ($\chi^2 = 19.9353$, $p = .0020$; $\chi^2 = 110.9895$, $p < .0001$, respectively) [Table/Fig-3]. The simple impression was performed in 57% of the maxillary dentures (32% were class III). While, greater prevalence of functional impression and sectioned cast technique were used for class I and II in the mandibular arch.

Regarding the major connector, the use of anterior-posterior bar associated with restorative dentistry and periodontal treatments were more prevalent in the maxillary arch (50%). The lingual plate was the most common major connector used in the mandible (32%). When the free-ending RPDs were concerned, the distal preparation of the support tooth was more prevalent on both arches [Table/Fig-4].

From the dental records evaluated between 2007 and 2012, 25 maxillary and 21 mandibular RPDs (46 total) were replaced. Most of the patients requiring RPD replacement were women (68% for maxillary arch and 86% for mandibular arch). Most of the replaced RPD kept the same design of the old denture [Table/Fig-5]. When the arches were analysed separately, the design of maxillary RPD differed from the previous denture [Table/Fig-6], while the mandibular RPDs kept the design of the old denture [Table/Fig-6].

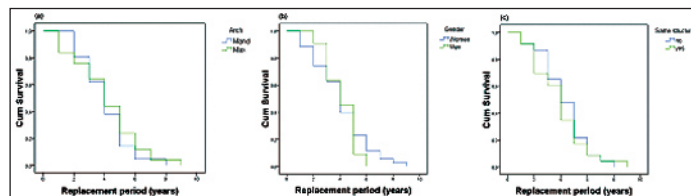
The main reasons for altering the design of the replaced RPD were changes to the treatment plan (50% of cases) for maxillary

Main complaint	Maxilla				Mandible			
	I	II	III	Total	I	II	III	Total
Aesthetic	7	19	16	41	17	17	14	48
Replacement of old denture	7	11	25	43	22	10	6	37
Chewing	2	10	4	16	7	4	3	14
Total	16	40	45	100	46	31	23	100

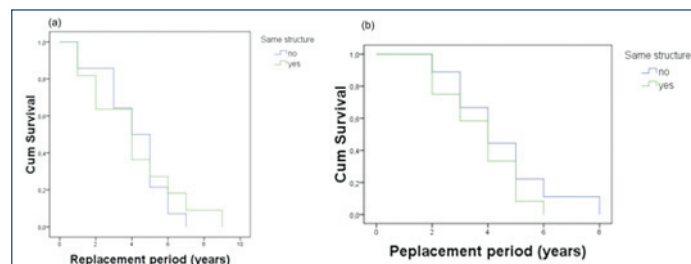
[Table/Fig-3]: Percentage distribution of RPDs according to main complaint and Kennedy classification (I, II and III). Chi-square ($\chi^2 = 12.1620$ ($p = .0162$)) maxilla. Chi-square ($\chi^2 = 13.0440$ ($p = .0111$)) mandible.

Free-ending tooth preparation	Maxilla	Mandible
Distal	59	68
Medial	1	2
Both	40	31
Total	100	100

[Table/Fig-4]: Percentage distribution of RPDs according to the tooth preparation side on the free-ending denture and edentulous arch.



[Table/Fig-5]: Kaplan-Meier RPD regarding arch type (a); regarding gender (b); regarding design change (c).



[Table/Fig-6]: (a) Kaplan-Meier for design change of the maxillary RPD; (b) for design change of the mandibular RPD.

Design change	Maxillary	Mandibular
Tooth extraction (free-end)	3 (21)	2 (22)
Tooth extraction (between supporting teeth)	4 (29)	5 (56)
Treatment plan change	7 (50)	2 (22)
Total	14 (100)	9 (100)

[Table/Fig-7]: Distribution (%) of RPDs that exhibited design change after denture replacement.

Desing change	Maxilla			Mandible		
	Female	Male	Total	Female	Male	Total
Yes	9 (36)	2 (8)	11 (44)	10 (48)	2 (10)	12 (57)
No	8 (32)	6 (24)	14 (56)	8 (38)	1 (5)	9 (43)
Total	17 (68)	8 (32)	25 (100)	18 (86)	3 (14)	21 (100)

[Table/Fig-8]: Distribution (%) of RPDs regarding design change and gender after RPD replacement.

Major connector	Periodontics	Restorative dentistry and Periodontics	Total
Antero-posterior bar	21	50	71
U-shaped palatal bar	2	1	3
Palatal plate	7	19	26
Total	30	70	100

[Table/Fig-9]: Percentage distribution of RPDs according to major connector and general buccal preparation for maxilla.

Major connector	Periodontics	Restorative dentistry and Periodontics	Total
Dental bar	2	3	5
Double lingual bar	3	7	10
Lingual bar	16	28	45
Lingual plate	9	32	40
Total	30	70	100

[Table/Fig-10]: Percentage distribution of RPDs according to major connector and general preparation for mandible.

arch, and extraction of the supporting tooth (56% of cases) for the mandibular arch [Table/Fig-7]. Most of the RPDs that were replaced due to time of wear maintained the design of the old RPD (73% of the maxillary RPDs and 92% of the mandibular RPDs) [Table/Fig-8].

The survival rate of RPDs were not affected by the variables investigated ($p > 0.05$, Log rank test). At the initial period, women required higher mandibular RPDs replacements; however, after four years an inversion of this data was noted [Table/Fig-5].

DISCUSSION

Most of the maxillary and mandibular RPDs were fabricated in women (64% and 68%, respectively), and the patients age ranged from 41 to 60-year-old [Table/Fig-1]. Which is in agreement with other studies that stated that most of the patients treated with RPDs are women (aged from 41 to 62-year-old). Some studies reported that the mean age for men is slightly higher which differs from our results [11,18,19].

The edentulous area was more present in the mandible than maxilla, other studies also showed that 70 to 80% of the RPDs are fabricated in the mandible [13,16]. Mandibular Kennedy class I RPDs were the most common denture [Table/Fig-2] which corroborates with previous data [11,20-22]. Free end dentures in the mandible, needed a higher percentage of adjustments of the denture base. This phenomenon is due to the progression of the resorption in the edentulous parts of the alveolar ridge, which is accentuated by the amount of pressure on the free end prostheses [16].

Since most of the RPD wearers are concerned about their appearance [9], they seek aesthetic improvements [23,24]. In this

study, we found significant association between main complaint (aesthetics) and Kennedy for both jaws [Table/Fig-3]. From the clinician point of view, patients feel more comfortable to use anterior maxillary RPDs in social occasions. Dentures are also important to enhance the smile of the user [15], and the aesthetic outcome is considered the main factor to improve the personal motivation of several subjects [15,23,24]. In this study changes to the treatment plan and tooth loss were the main causes of RPD replacements. The tooth loss RPD wearers may be explained by the increased risk of cavities and periodontal disease, as well as the increase in teeth mobility [11,14,23-26].

The major connector most frequently used, were anterior-posterior bar associated on the maxillary jaw (50%), and the lingual plate in the mandibular one (32%), both associated with restorative dentistry and periodontal treatments [Table/Fig-9,10]. Graham et al., reported that the use of acrylic RPDs are more associated to tooth loss in patients with poor oral hygiene in low-income areas [15], when compared to cobalt-chromium RPDs [27-29]. The cobalt-chromium RPDs are frequently indicated because of the better fit and retention, and lesser fracture incidence when compared with those fabricated with acrylic resin.

The prognosis of treatment with RPD is directly linked to the structure design, the comfort, aesthetics and the patients' oral hygiene. The positioning of maxillary connector with antero-posterior bar facilitates adjustment and prevents hyperplasia in the anterior region, easing the prostheses hygiene [30].

The support tooth preparation was performed mostly on the distal side in case of free-ending RPDs [Table/Fig-6]. It is believed that the distal on the supporting tooth protects the periodontium; however, it could induce tooth distalization [31]. The medial preparation is more frequent, even though it might cause damages to the gingival papilla to the periodontal tissue.

Our data showed that most of the maxillary (68%) and mandibular RPDs replacements (86%) were performed in women [Table/Fig-8], mostly in the mandible [20]. The literature also suggests greater number of interventions in the mandibular jaw when compared to the maxillary one [11,16]. Previous studies outlined more RPD replacements for the mandibula than maxilla, and failures occurred after 100 months [11,22].

For patients with Kennedy class I prostheses the difficulty to adapt during usage is one of the most significant complaints. The correct impression method should be indicated to reverse this lack of adaptation. Another possibility, is to perform a corrective molding when proving the metallic structure after the teeth assembly. A well-planned removable partial denture with appropriate extensions will benefit the patients, improving their masticatory function with more confort [32,33].

RPD is not the patients' first choice of treatment, but they expect it to look as aesthetic as any other contemporary treatment. The Kennedy class type IV demands specific care in order to restore the patients' aesthetics, a suitable lip physiognomy, correct selection of artificial teeth and sometimes the characterization of gingival mask can improve the aesthetic outcome. Better aesthetic results improves the patients social life [33,34] and the functional improvements have a positive impact in the OHRQoL [35].

The replacement interval indicates the treatment duration and success rate. The survival rate for both arches was approximately 40% after four years [Table/Fig-5]. Some authors reported a RPD survival rate of 75% after five years and 50% after 10 years [11,36]. Previous longitudinal study of 10 years confirm the data observed herein [16].

All data were collected through the observation of dental records from patients who underwent any RPD treatment during the preestablished period.

LIMITATION

One of the study limitations was the lack of information and malfulfill in some prontuaries, making it more difficult to extract the necessary information and there was no records of patient satisfaction to correlate to survival, which can be the theme for future studies.

CONCLUSION

Most of the RPDs were fabricated for women and in the mandibular arch. The main complaint and impression technique are important factors to consider during the treatment plan to guarantee a good success rate. There are a greater number of mandibular RPD replacements in women, but the survival analysis displayed an inversion proportion after 4 years between the maxillary and mandibular RPDs, as well as between genders. The survival rate of RPDs after this period was approximately 40% for both jaws.

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