



Original Article

A within-subject comparison of the conventional clasp-retained with attachment-retained removable partial dentures

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المخلص

أهداف البحث: تقييم رضا المرضى عن أطقم الأسنان الجزئية بالمشابك التقليدية مقابل تلك التي تعتمد على الثبات عن طريق الملحقات الدقيقة عند إعادة تأهيل الفك العلوي.

طرق البحث: تتضمن هذه الدراسة 10 مرضى يعانون من فقدان جزئي للأسنان العلوية تم تعويضها بتركيبات جزئية متحركة بمشابك تقليدية، وتم متابعتها على مدى ثلاثة أشهر من ثم استبدالها بتركيبات أخرى تعتمد على الملحقات الدقيقة، وتم متابعتها لثلاثة أشهر أخرى من دون عمل فترة راحة بين التركيبتين. خلال هذه الفترة طلب من المرضى تعبئة استبانة عن رضائهم عن التركيبات، وتشمل الاستبانة أسئلة تشمل سهولة التنظيف، والمقدرة على الكلام، والراحة، والجمالية، والثبات، والمقدرة على المضغ، وكفاءة المضغ، والرضا العام.

النتائج: أظهرت النتائج رضا أكثر للمرضى بالتركيبات المتحركة بالملحقات الدقيقة مقارنة بتلك المعتمدة على المشابك التقليدية، بسبب سهولة التنظيف، والمقدرة على الكلام، والراحة، والجمالية، والثبات، والمقدرة على المضغ، وكفاءة المضغ.

الاستنتاجات: تمثل التركيبات المتحركة المعتمدة على الملحقات الدقيقة بديل جيد عن تلك التي تعتمد على المشابك التقليدية خاصة عندما يتم تعويض الأسنان في الفك العلوي.

الكلمات المفتاحية: التركيبات المتحركة الجزئية؛ المشابك؛ الملحقات الدقيقة؛ رضا المرضى

Abstract

Objective: This study conducted to satisfaction with conventional clasp-retained and attachment-retained removable partial dentures (RPDs) among patients with partially edentulous maxilla.

Methods: The crossover trial recruited 10 patients with bilateral free-end partially edentulous maxilla who received a conventional RPD for 3 months, followed by an attachment-retained removable partial denture (ARRPD) for another 3 months. There was no washout period between the two interventions. During follow-up, patients were requested to complete a patient satisfaction questionnaire. This 9-item validated questionnaire measured patient satisfaction with the ease of cleaning, ability to speak, comfort, aesthetics, stability, ability to masticate different types of food, masticatory efficiency, oral condition, and general satisfaction.

Results: The comparison of the two treatment modalities showed significantly higher satisfaction with the ARRPD than with the conventional RPD. The ARRPD was preferred due to the ease to clean, speech, comfort, aesthetics, stability, masticatory ability, and masticatory efficiency ($p < .05$).

Conclusion: The study showed higher short-term satisfaction rates in patients with ARRPDs than with the conventional clasp-retained RPDs. The superior aesthetics of ARRPDs are recognized in conjunction with the restoration of the partially edentulous maxilla.

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Keywords: Attachment; Clasp; Patient satisfaction; RPD

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Introduction

Decay, periodontal disease, and trauma are all suggested to be factors contributing to tooth loss.^{1,2} There are many treatment options available for restoring missing teeth, including fixed partial restorations,^{3,4} removable partial dentures,^{5,6} and implant-supported prostheses.^{2,7–9} In any prosthetic rehabilitation, the preservation of the remaining teeth and associated structures are more important than the restoration of what is missing.¹⁰

For patients with free-end partially edentulous arches, removable partial dentures (RPDs) remain the treatment of choice, particularly when anatomical or financial factors place constraints on dental implant placement.¹¹

RPDs can be made entirely of acrylic or include metallic framework constructed of base metal alloys. Both types are considered predictable options that improve aesthetics, phonetics, and mastication.¹² However, Montero et al.¹³ found that metallic RPDs are more successful and recorded higher satisfaction scores than acrylic RPDs.

Compromised support and retention are the most common problems associated with distal end RPDs.¹⁴ The difference in the resiliency of the mucoperiosteum of the residual ridge and periodontal ligament surrounding the abutment teeth lead to rotation of the free-end RPD.¹⁰ This rotation will induce heavy stresses on abutment teeth and high vertical force on the residual ridge that lead to excessive bone resorption.¹⁰

The retention of RPDs can be achieved by using clasps or attachments that resist denture dislodgment from its supporting foundation. The clasp assembly should have retentive and reciprocal components. Often, the retentive arm engages buccal undercuts of the abutment teeth, which can result in poor aesthetic appearance, especially when placed on the upper anterior teeth.¹⁰ A wide range of attachments systems is available including intra-coronal, extra-coronal, or stud attachments.¹⁵ The use of attachments not only improves the retention and stability of RPDs, but overcome the esthetic problem that results from the metal display of the retentive clasp, particularly when this clasp is placed on the anterior maxillary teeth.^{16,17}

Patient satisfaction is a critical outcome for the evaluation of any proposed treatment modality. As stated by the World Health Organization, “Health is not only the absence of infirmity and disease but also a state of physical, mental and social well-being.”¹⁸ Retention, chewing ability, and aesthetics seem to be the most critical factors

affecting RPD acceptance and should be included in any tool used to measure patient satisfaction. Various tools exist to evaluate patient satisfaction; the most common tool used for that purpose is the visual analogue scale (VAS).^{19–21}

This study aimed to evaluate patient satisfaction with conventional clasp-retained RPDs and attachment-retained RPDs (ARRPDs) among patients with bilateral partially edentulous maxilla.

Materials and Methods

Patient selection

Using a minimum significant difference in the general satisfaction with a removable partial denture of 10 mm and a standard deviation of 8 based on the results of Ohkubo et al.,²² a total sample size of 10 patients with a confidence level of 95% and a power of 80% was calculated to be adequate to detect an effect size of 0.8.

The partially edentulous patients were selected from the outpatient clinic of the Prosthodontic Department of Cairo University based on the following inclusion criteria: partially edentulous class I maxillary arch (with missing teeth up to the canine bilaterally), adequate prosthesis space to place metallic framework and artificial teeth, good oral hygiene, and free of any systemic diseases that may affect oral health. The participants were asked to sign a consent form that included a description of the intervention.

Study design

The study design was a crossover trial. Participants received a conventional RPD for 3 months (period 1), followed by an ARRPD for another 3 months (period 2). There was no washout period between the two interventions.

Period 1: conventional RPD

For the first period, the missing teeth were replaced with a conventional RPD with two clasps on the distal abutment of each side, following standardized clinical procedures. These procedures included primary alginate impression, abutment teeth preparation to receive an RPD, secondary impression, metal framework fabrication and try-in, altered cast impression technique, teeth try-in, and, finally, the RPD was obtained by the patient (Figure 1). The patients were instructed on how to use their dentures properly. To avoid secondary irritation from the conventional RPD, which may have had a carry-over effect to period 2, patients were asked to contact the principal investigator to resolve any problems by adjusting any sharp borders or the pressure area. Furthermore, strict oral and denture hygiene measures were illustrated to every single patient. The patients were observed after 1, 2, and 3 months.

Period 2: ARRPD

At the end of the third month of period 1, the second period began with crown preparation of the two distal abutments on both sides of the edentulous areas. Patients received a surveyed bridge with two extra-coronal attachments and a new RPD was constructed following standardized clinical procedures. The ARRPD was constructed and picked up intraorally using cold-curing resin (Figure 2). The patients were instructed how to use their dentures and the denture hygiene method was illustrated. Again, the participants were followed-up after 1, 2, and 3 months.

Evaluation of patient satisfaction

During the follow-up of the two periods, patients were asked to complete a patient satisfaction questionnaire after 1, 2, and 3 months with each denture.

A validated 9-item questionnaire^{19–21} was used in this study to measure patient satisfaction in terms of ease of cleaning, ability to speak, comfort, aesthetics, stability, ability to masticate several types of food, masticatory efficiency, oral condition, and general satisfaction.

The patients rated each domain from 0 (lowest satisfaction) to 100 (highest satisfaction) on a VAS.

Statistical analysis

Statistical analysis was performed using SPSS v.21.0 for Windows (SPSS Inc). Data were collected, tabulated, and

statistically analyzed. The Wilcoxon signed-rank test ($\alpha = .05$) was used to compare patient satisfaction scores for the two treatment options. The paired t-test was used to compare between the different follow-up periods for each treatment.

Results

Ten partially edentulous patients with a mean age of 58.7 ± 9.3 years were selected (seven women and three men). Table 1 showed the participants' baseline data. Forty percent of participants had previously been treated with an RPD. The opposing mandibular arch was fully dentate in 20% of participants, complete dentures in 30%, and RPD in 50%.

The comparison of the two treatment modalities revealed significantly higher satisfaction with the ARRPDs than with the conventional RPDs. This was true regarding the ability to clean them, speech, comfort, aesthetics, stability, masticatory ability, and masticatory efficiency ($p < .05$), as shown in Table 2.

The effect of time on patient satisfaction from the first to the third months for the conventional RPD, as well as for the ARRPD, is presented in Figure 3.

Figure 3 shows that most of the questionnaire domains for the ARRPD increased from the first month to the third month, except the oral condition domain, which remained stable throughout the follow-up. For the conventional RPD, the general satisfaction, stability, and easy of cleaning decreased with time from the first month to the third month.



Figure 1: Conventional clasp-retained RPD; a, frontal intraoral view; b and c, side views.



Figure 2: Attachment retained RPD, a, frontal intraoral view, b and c sides view.

Table 1: Baseline characteristics of the included participants.

Patients age (years) Mean \pm SD		58.7 \pm 9.3
Sex	Male	3 (30%)
	Female	7 (70%)
Previous RPD	Yes	4 (40%)
	No	6 (60%)
Opposing mandibular arch	Natural teeth	2 (20%)
	Complete denture	3 (30%)
	RPD	5 (50%)

Table 2: Comparison of patient satisfaction for both types of dentures.

VAS domain		Mean	Std. Deviation	P-value
Ease of cleaning	RPD	74.800	9.7843	0.028*
	ARRPD	84.300	7.8464	
Ability to speak	RPD	72.200	7.0048	<0.0001*
	ARRPD	90.800	3.2931	
Comfort	RPD	68.800	6.2325	<0.0001*
	ARRPD	86.300	5.1865	
Aesthetics	RPD	67.500	6.7700	<0.0001*
	ARRPD	91.000	3.1623	
Stability	RPD	71.700	6.1110	<0.0001*
	ARRPD	87.500	4.8591	
Ability to masticate	RPD	72.000	6.3246	<0.0001*
	ARRPD	85.500	4.3780	
Masticatory efficiency	RPD	73.00	5.869	<0.0001*
	ARRPD	85.00	4.082	
Oral condition	RPD	75.500	8.3166	0.142
	ARRPD	80.000	4.0825	
General satisfaction	RPD	73.00	5.869	<0.0001*
	ARRPD	86.00	5.164	

RPD, conventional clasp-retained removable partial denture.

ARRPD, attachment-retained removable partial denture.

*: Statistically significant at $p \leq 0.05$.



Figure 3: Effect of time on patient satisfaction for each treatment modality.

Discussion

The restoration of the partially edentulous maxilla with RPDs demands specific care and attention, and patients should be prepared to accept the treatment.¹⁷ This study aimed to evaluate the patient satisfaction with conventional clasp-retained RPDs compared with that with attachment-retained RPDs among patients with the bilateral partially edentulous maxilla.

The results of this study revealed that patient satisfaction with conventional RPDs falls within the range reported in previous studies.^{23–27} Despite the study design or measurement tools, the mean satisfaction scores for the ARRPDs were among the highest reported for RPDs.^{23–27} The use of a clasp negatively influenced the overall aesthetics as a result of its metal display; moreover, it had adverse biological effects on the abutment. This is because it may increase the area for plaque accumulation, thus

affecting the gingival condition of the abutments and subsequently, resulting in damage to the supporting bony structures.¹⁰

The findings of the current study show that the patients had significantly higher satisfaction scores for ARRPDs than for conventional RPDs. The use of attachments not only eliminates the unaesthetic appearance of the clasp retainer but also enhances the retention and stability of the RPD.²⁸ In turn, this noticeably improved cleaning ability, masticatory efficiency, and the chewing and speaking ability of included patients when compared to those with conventional RPDs.

The differences in the resiliency of the supporting structures always presents a problem in case of distal extension bases; this is also the same situation when treating those patients with ARRPDs. Among the methods suggested to minimize the torque on abutment teeth and improve force redistribution between the teeth and edentulous ridge is an altered cast impression technique^{29,30} and splinting of the abutments.^{31,32}

Therefore, the altered cast impression technique was used in this study. The advantages of this technique include increasing the mucosal support and ensuring optimal occlusion that, in turn, decreases movement of the denture base, which leads to a decrease in stress transmitted to the abutment.^{29,30}

Before construction of ARRPDs, there is a need to splint the abutment teeth with a fixed prosthesis. Splinting is necessary for abutment teeth that are adjacent to distally extended ridges, especially when there is signs of ridge resorption or evidence of bone loss.³³ Moreover, splinting prevents further tooth loss and migration, as well as redistributing forces to all of the splinted teeth.^{31,32}

Proper selection of the attachment is an essential factor for the success of distal extension RPDs.^{28,34} Therefore, in this study, the Rheine 83 OT CAP attachment was used. The simplicity of manipulation, effective resiliency that ensures a stress-breaking function, and reducing the torque on the abutment teeth are among the main reasons for selecting this type of attachment.³⁵

In agreement with our findings, the study conducted by Persic et al.³⁶ compared patient satisfaction among a cohort of patients who received conventional RPD versus those who received ARRPD. They found that in addition to the aesthetic outcome of the ARRPD, comfort, stability while chewing, and speaking ability had higher satisfaction values than those for the clasp-retained RPDs.³⁶ However, the use of this attachment system requires technical and clinical skills, which subsequently leads to an increase in the cost of treatment.³⁷

There were some limitations to this study. Firstly, the short follow-up period limited the generalizability to long term clinical performance. Secondly, the sample size was relatively small. The use of a within-subject crossover study design, whereby each patient received both of the treatments and a comparison was made between the two decreases inter-participant variations and increases the sensitivity of the measurements.²¹ However, it does have the potential disadvantage of having both physical and psychological carryover effects; typically, a washout period is advised to overcome these.²¹ Unfortunately, this was not possible in this particular study as it would have been unethical to leave participants without a prosthesis. Consequently, a well-designed parallel randomized clinical trial with a larger sample size and longer follow-up period is recommended to effectively evaluate the effect of clasp versus attachments on the clinical outcomes of the RPD.

Conclusion

Within the limitations of this study, it can be concluded that the use of ARRPDs is a viable treatment modality when dealing with distal extension edentulous maxilla. It provides greater short-term satisfaction when compared to conventional clasp-retained RPDs, especially in terms of aesthetics.

Recommendation

The ARRPD is a good substitute for the conventional RPD, particularly when dealing with the restoration of the partially edentulous maxilla.

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This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of interest

The author has no conflict of interest to declare.

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The study design was approved by the ethics committee of faculty of dentistry, Cairo University.

Consent

For this type of study, Informed consent was obtained from all individual participants included in the study.

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