

Patient satisfaction toward aesthetic and functional outcomes: a comparative study of acrylic vs. cobalt-chrome removable partial dentures

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Abstract

Removable partial dentures (RPD) are effective prostheses for restoring both function and aesthetics following tooth loss. Patient satisfaction with RPD functional and aesthetic outcomes is critical in determining the success of RPD therapy. This study aimed to evaluate and compare patient satisfaction with the function and aesthetics of acrylic and cobalt chrome (Co-Cr) RPD and identify factors affecting patients' satisfaction with RPD. Ninety-one patients who received RPD from undergraduate dental students from Kulliyah of Dentistry (KOD), IIUM, participated in this study. The number of RPD issued for these patients was 150 units, with 121 (80.7%) acrylic and 29 (19.3%) Co-Cr RPD. Patients completed validated questionnaires consisting of four sections: demographics information, patient satisfaction towards the function of RPD, patient satisfaction towards aesthetics of RPD and patient perception towards retention and stability of RPD. Data analysis was conducted using Microsoft Excel 2016 and SPSS version 25. Mann-Whitney U tests were used to analyse and compare patient satisfaction levels of RPD. A chi-square test was used to examine patients' perceptions of retention and stability of their RPD. Analysis was set as $p < 0.05$ with a 95% confidence interval as statistically significant. The majority of patients reported greater functional and aesthetic satisfaction with acrylic removable partial dentures (RPDs) compared to cobalt-chromium (Co-Cr) RPDs. There was no significant relationship between patient satisfaction with retention and stability of RPD. In conclusion, acrylic RPDs were perceived to be superior to Co-Cr RPDs, and patient satisfaction was not influenced by the retention or stability of the RPDs.

Keywords: acrylic RPD, aesthetics, cobalt-chrome RPD, functions, patient satisfaction

Introduction

A removable partial denture (RPD) is a prosthesis replacing the missing teeth in a dental arch while preserving the remaining natural teeth. Its role extends beyond restoring mastication, speech, and

aesthetics; it also establishes proper relationships with remaining teeth, periodontal structures, and mucous tissues (Bessadet *et al.*, 2013). RPD can enhance masticatory efficiency in partially dentate patients, improving quality of life by enhancing aesthetics and stomatognathic system functions (Sharma *et al.*, 2018). A

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high-quality RPD significantly enhances oral health. Besides the dentist's skill and prosthesis quality, the subjective assessment by the patients is a key factor in determining treatment success (Awawdeh *et al.*, 2024).

Some patients express dissatisfaction with their RPD, even when the dentist graded it as satisfactory (Shala *et al.*, 2016). Patient dissatisfaction may occur when the recommended prosthetic designs, despite being clinically evaluated as optimal by the dentist, do not align with the patient's subjective expectations and preferences. Understanding how patients use partial dentures is crucial in guiding the decision-making process for both dentists and patients during treatment. Since patient satisfaction with partial dentures is highly subjective, it can be challenging to quantify and define.

A previous study stated that higher satisfaction scores were significantly associated with older age, upper RPD, and RPD fabricated by prosthodontic residents (Koyama *et al.* 2010). Gender, Kennedy classification, and denture type did not significantly affect patient satisfaction (Shala *et al.* 2016). Despite these findings, there remains a research gap in exploring the differences in satisfaction levels between acrylic RPDs and Co-Cr RPDs, as well as the impact of denture retention and stability on patient satisfaction.

This research aims to evaluate and compare patient satisfaction with acrylic and Co-Cr RPD in terms of function and aesthetics. In addition, it also focuses on assessing patient perceptions of the retention and stability of these two types of dentures and their relationship with patient satisfaction toward RPD.

Materials and Methods

Data collection

The sample size for the patient population using RPD was determined through Raosoft software (Washington, USA). Ethical

approval for the study was granted by the IIUM Research Ethics Committee (IREC), under approval number IREC 2023-064. Patient data were retrieved from the patient database at the Prosthodontics Clinic, Kulliyah of Dentistry (KOD), International Islamic University Malaysia (IIUM). Patients who received RPDs from IIUM undergraduate dental students between 2018 and 2021 were contacted by phone. Those who had not completed the RPD construction or received other types of prostheses were excluded from the study. Those who provided informed consent were invited to complete a set of validated questionnaires. The questionnaires, verified by three Prosthodontics specialists, comprised four sections: demographic information, patient satisfaction regarding the satisfaction towards the function of the RPD, satisfaction with its aesthetics, and perceptions of its retention and stability. Sections B and C utilised a five-point Likert scale, while Section D consisted of binary-type questions.

Data analysis

The collected data were organised and analysed using Microsoft Excel 2016 and SPSS version 25. The normality of the data was assessed using the Kolmogorov-Smirnov test. Descriptive statistics, including means and percentages, were calculated for the demographic data. For bivariate analysis, given that the data were not normally distributed, non-parametric Mann-Whitney U tests were employed to compare patient satisfaction levels and differences in satisfaction between acrylic and Co-Cr RPD. The Chi-square test was utilised to examine patients' perceptions of the retention and stability of RPDs. Statistical significance was set at $p < 0.05$, with a 95% confidence interval.

Results

Demographic information

Ninety-one (91) patients consented to participate in this research. 52.8% (48) of

patients were male, and 47.3% (43) were female (Figure 1). The patient's age ranged between 25 to 84 years old, with a mean age of 59.5 ±11.5 years. Patient demographic based on their occupational status: 14.2% were government employees, 37.4% were

pensioners, 6.6% were private sector employees, 8.8% were self-employed, and 33.0% were unemployed (Figure 2). The total RPD issued was 150 units, with 80.7% (121) being acrylic RPD and 29 (19.3%) being cobalt-chrome RPD (Figure 3).

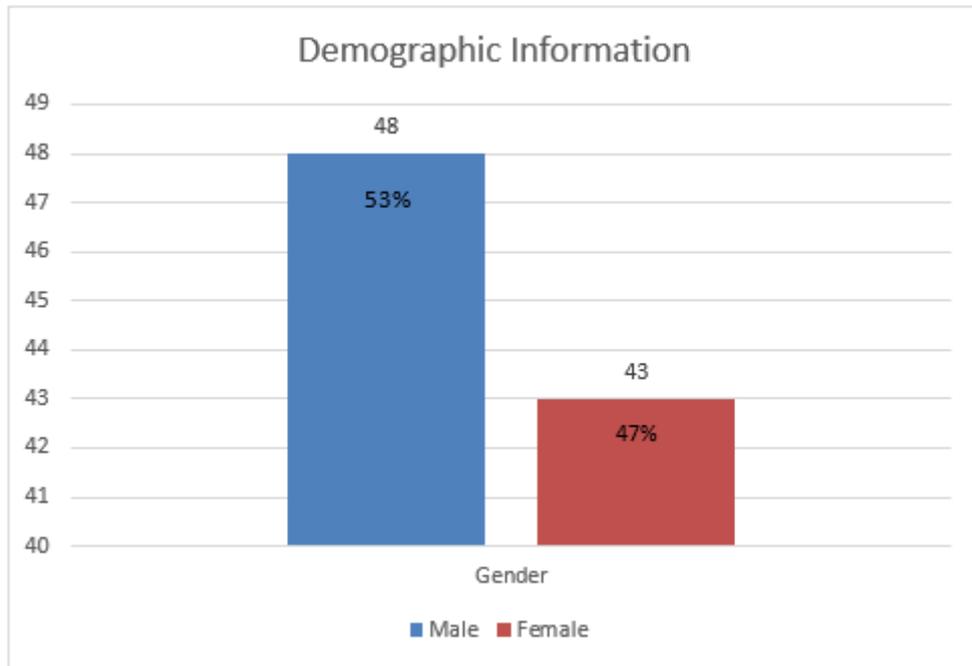


Figure 1. Gender distribution of the patient.

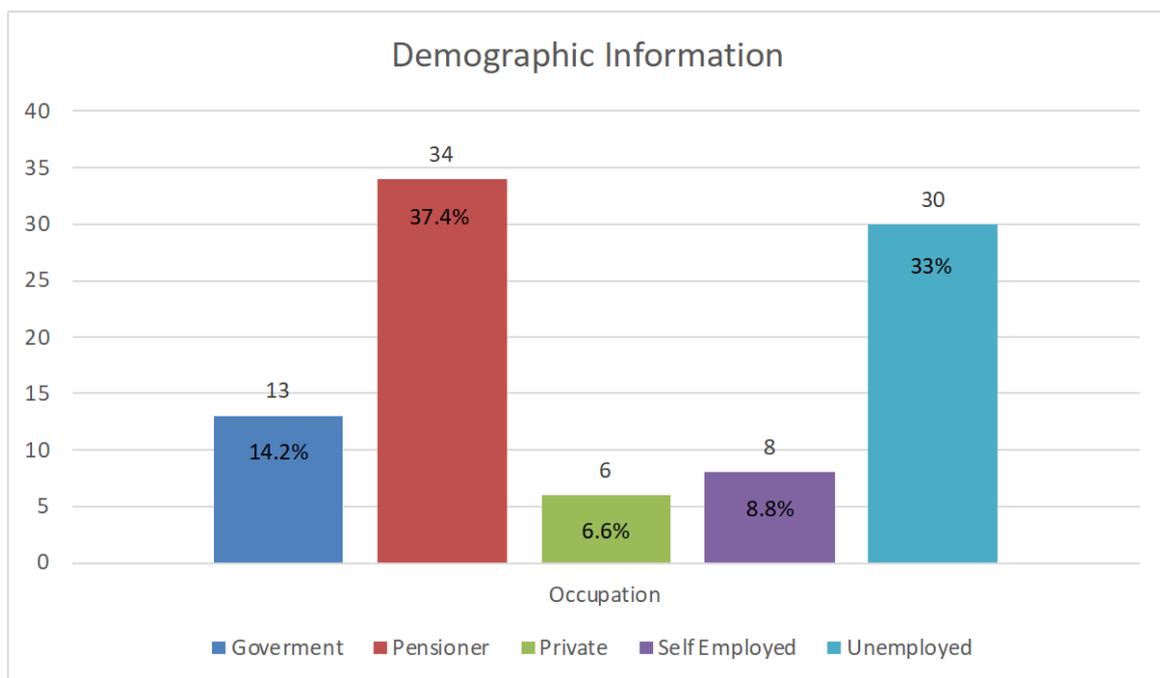


Figure 2. Occupation distribution of the patients.

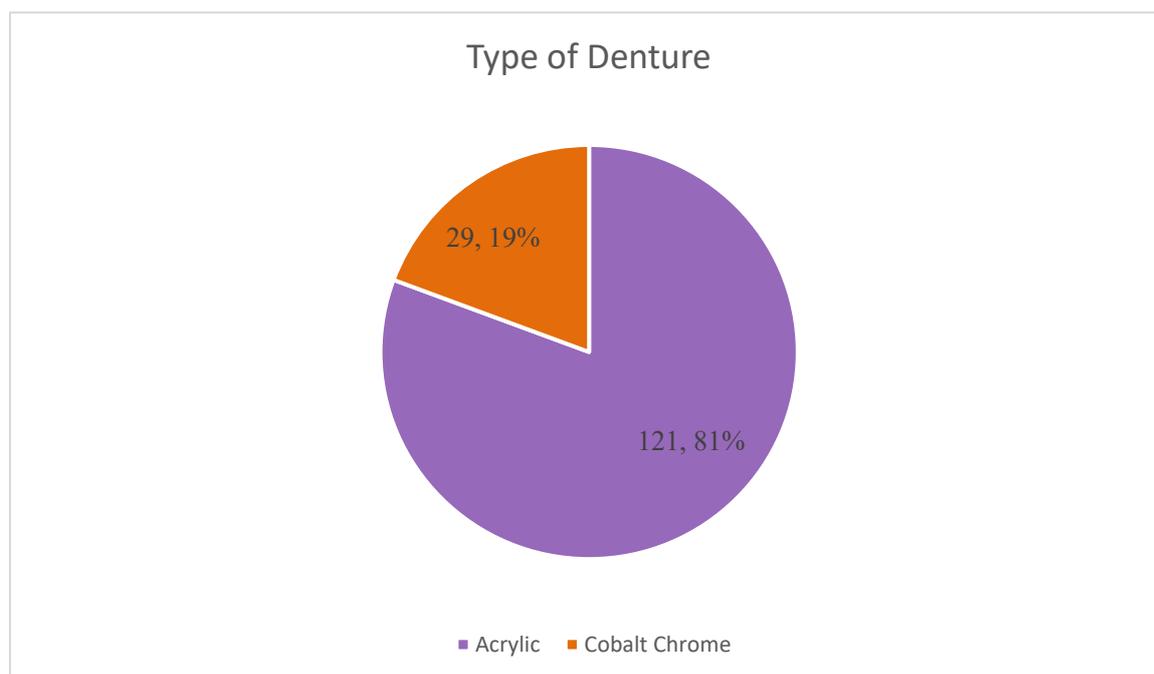


Figure 3. Number of units of RPD according to the type of RPD.

Patient satisfaction towards the function of RPD

The Mann-Whitney U test was used in bivariate analysis to assess the correlation of patient satisfaction with the function of RPD and to differentiate the level of satisfaction between acrylic RPD and Co-Cr RPD (Table 1). Patient satisfaction with acrylic RPD was notably higher, ranging from 56.2% to 64.5% across speaking ability, masticatory function, ease of insertion and removal, and swallowing, while satisfaction with Co-Cr RPD ranged from 27.6% to 51.7% for the same parameters. Statistical analysis demonstrated significantly higher satisfaction with acrylic RPDs for chewing ability ($p = 0.022$), masticatory function ($p = 0.003$), and swallowing ability ($p = 0.005$). However, satisfaction levels for ease of insertion and removal did not differ significantly between the two groups ($p = 0.199$), with 63.6% of patients satisfied with acrylic RPDs and 51.7% satisfied with Co-Cr RPDs.

Patient satisfaction towards aesthetics of RPD

Table 2 indicates a bivariate analysis of patient satisfaction towards acrylic and Co-Cr RPD for aesthetics parameters. Six aesthetic parameters were evaluated, encompassing the shade of artificial teeth, the shape and size of the teeth, the arrangement of the teeth, the compatibility of acrylic teeth with natural dentition, and the facial support provided by the RPD. Patient satisfaction with the aesthetics RPD was generally high for both acrylic and Co-Cr RPD, with satisfaction ranging from 88.4% to 92.6% for acrylic RPD and 79.3% to 86.2% for Co-Cr RPD across all aesthetic parameters. However, satisfaction with acrylic RPD was significantly higher for specific aesthetic parameters, including teeth shade ($p = 0.012$), teeth shape ($p = 0.011$), teeth size ($p = 0.017$), and teeth set-up ($p = 0.005$). No statistically significant differences were observed between the two groups in the compatibility of artificial teeth with natural teeth ($p = 0.057$) or in facial support ($p = 0.637$).

Table 1. Patient satisfaction on functional parameters of RPD.

Function	Type of denture	SD-D	Neutral	A-SA	p-value
Speaking ability	Acrylic	18(14.9)	33(27.3)	70(57.85)	0.022*
	Co-cr	8(27.59)	11(37.93)	10(34.48)	
Masticatory function	Acrylic	18 (14.9)	35 (28.9)	68 (56.2)	0.003*
	Co-cr	9 (31.0)	12 (41.4)	8 (27.6)	
Remove and insert the denture	Acrylic	17 (14.0)	27 (22.3)	77 (63.6)	0.199
	Co-cr	6 (20.7)	8 (27.6)	15 (51.7)	
Swallowing	Acrylic	15 (12.4)	28 (23.1)	78 (64.5)	0.005*
	Co-cr	7 (24.1)	10 (34.5)	12 (41.4)	

SD-D: Strongly Disagree - Disagree, U: Unsure, A-SA: Agree - Strongly Agree

Table 2. Patient satisfaction with the aesthetic of RPD.

Aesthetics	Type of dentures	SD-D	Neutral	A-SA	p-value
Teeth shade	Acrylic	2 (1.7)	12 (9.9)	107 (88.4)	0.012*
	Co-cr	3 (10.3)	3 (10.3)	23 (79.3)	
Teeth shape	Acrylic	2 (1.7)	10 (8.3)	109 (90.1)	0.011*
	Co-cr	3 (10.3)	3 (10.3)	23 (79.3)	
Teeth size	Acrylic	2 (1.7)	10 (8.3)	109 (90.1)	0.017*
	Co-cr	3 (10.3)	3 (10.3)	23 (79.3)	
Teeth set-up	Acrylic	2 (1.7)	8 (6.6)	111 (91.7)	0.005*
	Co-cr	3 (10.3)	3 (10.3)	23 (79.3)	
Compatibility with natural teeth	Acrylic	2 (1.7)	12 (9.9)	107 (88.4)	0.057
	Co-cr	3 (10.3)	3 (10.3)	23 (79.3)	
Facial support	Acrylic	3 (2.5)	6 (5.0)	112 (92.6)	0.634
	Co-cr	0 (0.0)	4 (13.8)	25 (86.2)	

SD-D: Strongly Disagree - Disagree, U: Unsure, A-SA: Agree - Strongly Agree

Patient satisfaction towards retention and stability of acrylic and Co-Cr RPD

The chi-square test was used to evaluate patient perceptions of retention and stability for acrylic and cobalt-chromium (Co-Cr) removable partial dentures (RPDs), as shown in Table 3. Patient satisfaction with retention and stability was higher for acrylic RPDs, with 78.4% and 80.3% of patients reporting satisfaction, respectively, compared to 21.6% and 28.9% for Co-Cr RPDs. However, despite these observed

differences, the results were not statistically significant.

Relationship between retention and stability of RPD with patient’s satisfaction level

The Mann-Whitney U test was used to assess the relationship between patient satisfaction and the retention and stability of RPD. The analysis revealed no significant relationship between patient satisfaction and retention ($p = 0.44$) or stability ($p = 0.633$) of the RPD, as shown in Table 4.

Table 3. Patient satisfaction with retention and stability of the RPD.

	Type of dentures	Yes	No	Chi-Square	p-value
Retention of the denture	Acrylic	29 (78.4)	42 (77.8)	0.005	0.946
	Co-cr	8 (21.6)	12 (22.2)		
Stability of the denture	Acrylic	53 (80.3)	18 (72.0)	0.729	0.393
	Co-cr	13 (28.0)	7 (19.7)		

Table 4. Relationship of overall patient satisfaction with retention and stability of RPD.

Variables	Answer	SD-D	Neutral	A-SA	p-value
Retention	Yes	2 (5.4)	8 (26.1)	27 (72.9)	0.44
	No	6(11.1)	10 (18.5)	38 (70.3)	
Stability	Yes	6 (9.1)	12 (18.2)	48 (72.7)	0.633
	No	2 (8.0)	6 (24.0)	17 (68.0)	

Discussion

The removable partial denture (RPD) remains a viable option in rehabilitating partially edentulous patients, as it restores critical oral functions like mastication and aesthetics while preserving the remaining natural dentition (Campbell *et al.*, 2017). Patient satisfaction with RPD is influenced by various factors, including the patient's age, personality, past denture experience, expectations, aesthetics, residual ridge anatomy, denture quality, construction methods, dentist expertise, and the quality of dentist-patient relationships (Čelebić & Knezović-Zlatarić, 2003), (Koyama *et al.*, 2010). This study explores and compares patient satisfaction with acrylic and Co-Cr RPD fabricated by undergraduate students at IIUM. Furthermore, it evaluates patients' perceptions of RPD retention and stability and investigates how these factors correlate with overall satisfaction.

This study evaluated four functional parameters of RPD, including speaking ability, masticatory function, ease of removing and inserting the denture, and swallowing. Most patients reported satisfaction with the functional performance of both types of RPD, acrylic RPD (56.2 to 64.5%) and Co-Cr RPD (27.6% to 51.7%). Notably, acrylic RPD were found to be superior to Co-Cr RPD in all functional parameters except for ease of insertion and

removal. However, this finding contrasts with earlier studies by Almufleh *et al.* (2020), which reported no significant difference in patient satisfaction with the functional performance of acrylic and Co-Cr RPD. This discrepancy highlights the need for further studies to understand the factors influencing patient preferences and satisfaction.

For satisfaction towards the aesthetic appearance of the RPD, six aesthetic parameters were assessed, including the shade, shape, and size of artificial teeth, their arrangement, the compatibility of acrylic teeth with natural dentition, and the facial support provided by the RPD. Most patients expressed high satisfaction with the aesthetic outcomes of RPD, with satisfaction levels ranging from 79% to 92% across all parameters for both acrylic and Co-Cr RPD. Takaichi *et al.* (2022) highlighted that this high level of satisfaction is attributable to the ability to customise the RPD to match the patient's natural teeth in terms of colour, shape, size, and alignment. By achieving a close match with the natural dentition, RPDs can provide a harmonious and aesthetically pleasing smile, enhancing the patient's confidence and self-esteem (Čelebić & Knezović-Zlatarić, 2003).

Furthermore, comparing acrylic and Co-Cr RPD regarding aesthetic outcomes revealed that patient satisfaction with acrylic RPDs

was statistically higher for specific parameters, including teeth shade, shape, size and alignment. Acrylic dentures allow for easier customisation in shape and colour, enabling them to better align with individual patient preferences and enhance satisfaction levels (Nejatian *et al.*, 2023). This feature is less feasible with Co-Cr due to the frameworks' rigidity and appearance (Bosînceanu *et al.*, 2019). This finding aligns with results from M. Awan *et al.* (2018), who reported that most patients expressed greater satisfaction with acrylic RPD compared to Co-Cr RPD regarding aesthetic appearance. Acrylic resin also offers superior aesthetic blending with surrounding oral tissues due to its colour-matching potential, creating a more natural appearance than the metallic framework of Co-Cr RPDs (Hamze *et al.*, 2020). Additionally, acrylic RPDs typically have less visible metal components, making them less conspicuous during speech or smiling. In contrast, Co-Cr RPD often involves noticeable metallic parts, detracting from their aesthetic appeal (Campbell *et al.*, 2017).

This study also demonstrated that acrylic and Co-Cr RPD exhibit excellent retention and stability. However, in comparison, the study suggests that while acrylic RPDs demonstrate marginally better retention and stability than their Co-Cr counterparts, this difference does not reach statistical significance. This observation could be attributed to the inherent material properties of acrylic. Acrylic is less firm and has a slightly more elastic nature compared to cobalt-chrome metal, which may allow it to adapt more closely to the contours of the oral tissues (Cortés-Sandoval *et al.*, 2015), potentially enhancing the retention and stability of the prosthesis. However, the lack of statistical significance suggests that these differences might not have a substantial clinical impact or may vary depending on individual anatomical and functional factors. Further analysis revealed no positive relationship between overall patient satisfaction with denture retention and stability for both types of dentures. Thus, the retention and stability of dentures do not influence patients' satisfaction with RPD.

Conclusion

Co-Cr and acrylic RPD are associated with high levels of patient satisfaction. However, acrylic RPD demonstrates higher satisfaction than Co-Cr RPD in terms of both functionality and aesthetics. Overall, patient satisfaction tends to favour acrylic RPD over Co-Cr counterparts. Despite both RPD types exhibiting excellent retention and stability, these factors do not significantly influence patient satisfaction with the RPD. Further studies are recommended to explore additional factors influencing satisfaction to better guide in clinical decision-making.

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