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Patient-Reported Outcomes of Metal and Acrylic Resin Removable Partial Dentures: A Systematic Review and Meta-Analysis

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Abstract

Purpose: Metal removable partial dentures (RPDs) are often considered long-term treatment options for partially edentulous patients, while acrylic resin RPDs are considered interim treatments. The aim of this review was to compare metal and acrylic resin RPDs regarding patient-reported outcomes for partially edentulous individuals.
Materials and Methods: Four databases (MEDLINE, EMBASE, CENTRAL, and Web of Science) were systematically searched for observational studies and randomized controlled trials comparing patient-reported outcomes between metal and acrylic resin RPDs. The primary outcome was patient satisfaction. Included studies were assessed for risk of bias using the Cochrane risk of bias in nonrandomized studies of interventions tool (ROBINS-I) and the Cochrane Collaboration Risk of Bias Tool for Randomized Controlled Trials. The level of evidence was evaluated using Oxford Center for Evidence-based Medicine tool. A random-effects model was used to analyze the data.
Results: A total of 15 studies were included in the systematic review; 10 in the meta-analysis. The pooled effect size for patient satisfaction and oral health-related quality of life showed no statistical significant difference between metal and acrylic resin dentures (0.22, 95% confidence interval –0.01, 0.45, $p = 0.06$; 1.45, 95% confidence interval –2.43, 5.33, $p = 0.46$, respectively). Compliance with using RPDs was significantly higher in patients with metal compared to patients with acrylic resin dentures (pooled odds ratio = 0.57, 95% confidence interval 0.45, 0.73, $p < 0.001$). Most studies had critical to serious risk of bias and low level of evidence.
Conclusions: The reviewed studies showed that there was no significant difference between metal and acrylic resin RPDs in patient satisfaction and oral health-related quality of life. Metal dentures were associated with higher patient compliance rates and were preferred more by patients compared to acrylic resin dentures. However, the reviewed studies had low levels of evidence and therefore, high-quality randomized controlled trials are needed to conclusively address the question of this review.

Despite the declining rate of tooth loss[1] and the increased demand for implant restorations in developed countries,[2] removable partial dentures (RPDs) remain a widely used treatment option to restore function in partially edentulous patients.[3,4] In the current practice, metal RPDs are used as a long-term treatment option and acrylic resin RPDs as an interim treatment option.[5] Interim dentures are usually indicated as a part of the overall treatment plan to maintain space, condition teeth, or residual ridges, re-establish occlusal relationship, and restore function and esthetics during the course of treatment.[6,7] Metal dentures are usually designed carefully following specific biomechanical considerations to achieve optimum retention,

stability, and support in order to minimize damage to surrounding structures.[7,8] Acrylic resin dentures are designed to be mucosal-borne, which is thought to violate the biomechanical considerations of RPD design and is believed to be injurious for the adjacent structures if such dentures are used for long term.[5,7]

Clinical survey studies show that acrylic resin RPDs are used frequently and for long periods.[9,10] In fact, they comprise around 33% to 75% of RPDs provided to patients in different countries.[9-11] In some countries, only acrylic resin RPDs are covered by governmental health insurance, so this is the only accessible restoration for patients of lower socioeconomic status.[12,13]

Recently, using patient-reported outcomes, such as quality of life and patient satisfaction to evaluate treatment effectiveness of therapeutic interventions, including prosthodontic interventions, has gained popularity.[14-21] In the field of RPDs, there is a paucity in the literature concerning the patient-reported outcomes.[22] Previous attempts to synthesize evidence in these outcomes included only metal RPDs.[22-27] They identified factors that affect patient-reported outcomes, which include patients age, previous prosthesis experience, type of edentulism, including location, number, and symmetry of missing teeth and color and shape of prosthetic teeth.[22] However, the effect of denture base was not evaluated in these publications.[28] This supports the need to synthesize the available knowledge on patient-reported outcomes for patients wearing metal and acrylic resin RPDs, which could help update current clinical guidelines.

Therefore, the objective of this systematic review was to answer the following question: "is there any difference in outcomes reported by partially edentulous individuals wearing metal or acrylic resin RPDs?"

Materials and methods

This systematic review was registered in (Prospero #CRD42018109807) (http://www.crd.york.ac.uk/PROSPERO/display_record.php?ID=CRD42018109807) and was reported following PRISMA guidelines.[29,30]

A systematic search strategy, developed with the help of a medical librarian trained in systematic review searching, was created for the MEDLINE OVID database and then adapted for EMBASE, CENTRAL Cochrane Central Register of Controlled Trials, and Web of Science (Table 1). The search strategy included Medical Subject Heading (MeSH) terms or their equivalent where available, and keywords for the population and interventions. All databases were searched from inception to October 4, 2016; the searches were then updated on May 4, 2018. No language restrictions were applied. A hand search was conducted by manually checking relevant references of included articles, and relevant reviews.

For inclusion in the review, a study must have reported outcome data for both types of RPDs, metal and acrylic resin. All studies in any language were included in this review if they had an English abstract. Only conventional clasp-retained cast metal RPDs made of cobalt-chromium alloys were included. Implant-supported, telescopic crown-retained or removable partial overdentures were excluded as these designs are more expensive, more complicated, and not widely used in treating partially edentulous patients.[31] Only mucosal-borne (tissue-supported) acrylic resin RPDs with or without wrought metal clasps were included. Acrylic resin RPDs made with metal reinforcement in terms of bars, cast clasps, or rests were excluded. Unilateral RPD designs were also excluded because of contraindication of use and the inherent risk of aspiration.[32]

The primary outcome for this review was patient satisfaction. The secondary outcomes included oral health-related quality of life (OHRQoL) and patient compliance rates with RPD treatment and RPD preference. In this review, the level of patient compliance with RPDs was related to use of the dentures occasionally or discarding the dentures. Considering the expected low number of randomized clinical trials, observational studies were included in this review. Case reports, case series, expert opinions, commentaries, editorials, reviews, and conference abstracts were excluded.

Three reviewers (BA, AA, and RR) screened the abstract and full-text of potentially relevant articles independently. Disagreement between reviewers was resolved by consensus.

Data extraction and risk of bias assessment were conducted independently by two coauthors (BA and RR) and disagreement was resolved by consensus. The data included: patient characteristics (age, sex, previous RPD experience, Kennedy classification of edentulism, number and location of missing teeth, oral and RPD hygiene habits, and opposing arch status), prosthesis-related characteristics (RPD design, RPD age, and RPD use), study characteristics (study location, year of publication, study design, target population, sampling strategy, study setting, sample size, follow-up time, response rate or dropout rate, and characteristics of nonrespondents), type of measurement instruments, and outcome data. Corresponding authors of eligible studies were contacted via email for missing information or for clarification of reported data when necessary.

The Cochrane Risk of Bias Assessment Tool for Randomized Controlled Trials[33] and the Cochrane Risk of Bias in Nonrandomized Studies of Interventions Tool (ROBINS-I)[34] were used to assess the risk of bias for randomized controlled trials and observational studies, respectively.

The ROBINS-I tool includes seven domains: bias due to confounding, selection of participants, classification of intervention, deviation from intended intervention, missing data, measurement of outcomes, and selection of the reported results.[34] For the bias due to confounding domain, the following potential confounders were examined: RPD age, number of restored anterior and posterior teeth, Kennedy classification of partial edentulism, status of opposing arch, previous RPD experience, patient age and sex, and RPD quality.[22,35,36] The level of evidence was evaluated using the Oxford Center for Evidence-based Medicine.[37]

Standardized mean difference (SMD), mean difference, and odds ratio were used to compare acrylic resin and metal RPDs on patient satisfaction, OHRQoL, and patient compliance, respectively. Inverse-variance statistical method in a random effects model was used to account for interstudy variations.[38]

Heterogeneity among the pooled studies was tested using Cochrane Q test and I^2 static. I^2 statistic of more than 50% was considered an indicator of heterogeneity of outcomes. A $p < 0.05$ was considered significant.

Funnel plots of studies included in the meta-analysis were used to assess potential publication bias. Tests of funnel plots

Table 1 Systematic review search strategy

DATABASE	Search strategy accessed October 4, 2016, updated May 4, 2018
MEDLINE	#1—(Jaw, Edentulous, Partially [MeSH]) OR (partial* adj5 (dentition* or dentate* or edentul*)) OR (Dental Clasps [MeSH]) OR (Denture, Partial, Removable [MeSH]) OR (removabl* adj3 partial* adj5 (denture* or dent* or prosth*)) OR (RPD) OR ((kennedy or aramany) adj1 class*) #2—(Methacrylates [MeSH]) OR (Methylmethacrylate [MeSH]) OR (Acrylic Resins [MeSH]) OR (Resins, Synthetic [MeSH]) OR (acrylic* or acrylate*) OR (MMA or PMMA) OR (Denture Bases [MeSH]) OR (Denture Design [MeSH]) OR (Denture Bases [MeSH]) #3—(Dental Alloys [MeSH]) OR (Vitallium [MeSH]) OR (metal* or alloy*) OR (cobalt or chrome or chromium or titanium or molybdenum) OR (vital?ium) #1 AND (#2 OR #3)
EMBASE	1: (removable partial denture [EMTREE]) OR (edentulousness [EMTREE]) OR (dental clasp [EMTREE]) OR (partial* adj5 (dentition* or dentate* or edentul*)) OR (removabl* adj3 partial* adj5 (denture* or prosth*)) OR (RPD) OR ((kennedy or aramany) adj1 class*) 2: (acrylic acid resin [EMTREE]) OR (methacrylic acid [EMTREE]) OR (methacrylic acid methyl ester [EMTREE]) OR (denture base [EMTREE]) OR (denture design [EMTREE]) OR (acrylic* or acrylate*) OR (MMA or PMMA) 3: (vitallium [EMTREE]) OR (dental alloy [EMTREE]) OR (metal* or alloy*) OR (cobalt or chrome or chromium or titanium or molybdenum) OR (vital?ium) 4: #1 AND (#2 OR #3)
CENTRAL	MeSH descriptor: [Denture, Partial, Removable] OR MeSH descriptor: [Jaw, Edentulous, Partially] OR RPD OR vitallium OR removable partial prosthesis OR partial removable denture
WEB OF SCIENCE	#1: TS = ((removabl* NEAR/3 partial* NEAR/5 (denture* or prosth*)) OR RPD OR ((kennedy or aramany) NEAR/1 class*) OR (partial* NEAR/5 (dentition* or dentate* or edentul*))) #2: TS = (MMA or PMMA or acrylic* or acrylate* or methacrylic* or methacrylate* OR Methylmethacrylic* or methylmethacrylate* OR denture base* OR denture design*) #3: TS = (cobalt or chrome or chromium or titanium or molybdenum or metal* or alloy* OR vital$ium) #4: 2 OR 3 #5: 4 AND 1

asymmetry were not performed as less than 10 studies were included in the meta-analysis. All analyses were conducted using Review Manager 5.3 software (Cochrane Collaboration, Copenhagen, Denmark).

Results

The electronic search yielded 4056 citations. After the removal of 670 duplicates and excluding noneligible articles, 119 articles were retained for full text screening. Out of these articles, 15 studies were included in the systematic review and 10 in the meta-analysis (Fig 1).

All studies were cross-sectional except two studies. One was a randomized trial[39] and the other was a cohort study[40] (Table 2). The earliest study was published in 1968[41] and the most recent in 2018.[11] The follow-up period was 21 days for the clinical trial with 0% dropouts[39] and 1 month for the cohort study with 6% dropout.[40] Most of the cross-sectional studies evaluated dentures that were worn for a period of 1 to 5 years.[11,36,41-48] Response rate in these studies ranged from 31.4%[42] to 90%.[43]

Populations in most of the studies were patients treated in dental schools except three studies: two studies recruited patients from public hospitals[42,49] and one recruited a random sample of old noninstitutionalized individuals living in Zwolle,

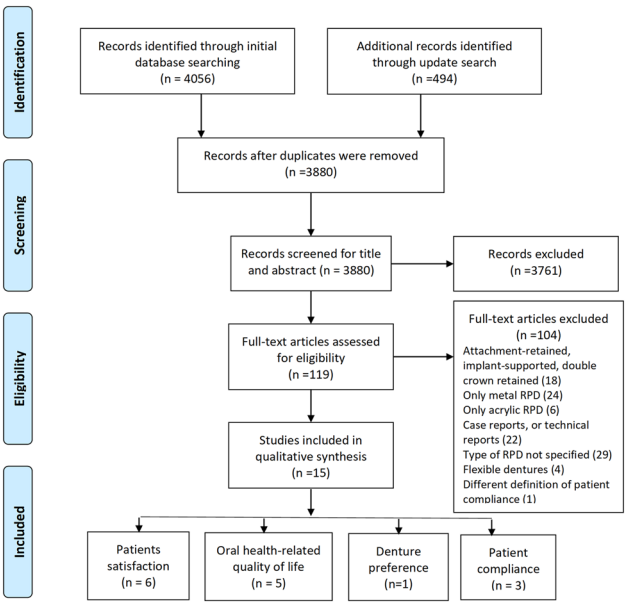

Figure 1 PRISMA flow chart of studies selection.

Table 2 Summary of included studies in the systematic review

First author, location, date of study	Study design	Recalled sample (n)Dentures/ patients	Response rate%	Age mean ± SD (range) years	Female %	Outcome	Time since denture delivery (years)
Watson et al, UK, 1986	Cross-sectional	NR/53 M = 56/43 A = 15/10	58%	53.8 (17 to 79)	38%	Patient satisfaction	1 to 3
Van Waas et al, Netherland, 1994	"	168/123 M = 71/47 A = 97/76	74%	(55 to 74)	NR	"	NR
Wakabayashi et al, Japan, 1998	"	94/66 M = 46/NR A = 48/NR	NR	61.2 (42 to 74)	63%	"	"
Zlataric et al, Croatia, 2000	"	243/165 M = 143/NR A = 100/NR	"	(38 to 87)	64%	"	0.5 to 5
Zlataric et al, Croatia, 2003	"	261/205 M = 154/NR A = 107/NR	"	(38 to 89)	61%	"	NR
Aljabri et al, Saudi Arabia, 2017	"	NR/60 M = NR/20 A = NR/20	60%	51.18 ±13.06 (23 to 73)	50%	"	< 1
Montero et al, Spain, 2013	Prospective cohort	NR/78 M = NR/58 A = NR/20	6%[a]	64 ± 10	48%	OHRQoL	1 month
Shaghaghian et al, Iran, 2015	Cross-sectional	284/200 M = NR/110 A = NR/67 A+M = 28/14	79%	55% ≥50	61%	"	<1: 54.8% >1: 45.2%
Abuzar et al, Australia, 2012	"	211/232 M = NR/97 A = NR/132b	31.4%	78% >60	45%	"	<2: 38.8% 2 to 10:31% >10: 30.2%
Wahbi and Elamin, Sudan, 2018	"	567/370 M = NR/18 A = NR/352	NR	(35 to 60)	73.2%	"	<0.5: 38.9% 0.5 to 1: 45.1% >1: 15.9%
Ali, UK, 2017	"	91/84 M = 54/54 A = 23/23 A+M = 7/7	70%	65.8 ± 13.4	44%	"	2 months-1
Akeel, Saudi Arabia, 2010	Cross-sectional	75/47 M = 50/NR A = 25/NR	90%	47 (30 to 69)	0%	Patient compliance	1
Sawada et al, Japan, 2003	"	158/158 M = 27/27 A = 131/131	61.2%	56.2 ± 10.1	83.5%	"	5
Amemori et al, Japan, 1968	"	1168/1056 M = 574/NR A = 594/NR	NR	NR	NR	"	0.5 to 5

Abbreviations: A, acrylic resin removable partial denture; M, metal removable partial denture; NR, not reported; SD, standard deviation; OHRQoL, oral health-related quality of life.

[a]Dropout.

[b]This group represents people who have acrylic resin removable partial denture only or one acrylic resin and one metal removable partial denture.

the Netherlands using the city registration system.[12] Most of the studies were published in English, except two studies, which were published in Japanese.[41,45] All included Japanese publications had data only on patient compliance rates with RPD treatment.[41,45]

A total of six studies assessed patient satisfaction,[12,46-50] five studies assessed OHRQoL,[11,36,40,42,44] three studies evaluated patient compliance rates,[41,43,45] and one study reported patients' preference of RPD (Fig 1).[39] In three studies only, the primary outcome was the comparison between acrylic resin and metal RPDs on patient-reported outcomes.[39,40,49] Other studies included data as a consecutive cohort.[11,12,36,41-48,50]

The randomized clinical trial included in this review had a low risk of bias in all domains except allocation concealment and blinding of participants, care providers, and outcome assessors, which were unclear.[39] All the included observational studies had critical to serious risk of bias (Table 3).

Sampling strategies and target population, comparability of respondents to nonrespondents, and data regarding potential confounders in the intervention and comparison groups were not adequately reported in the studies. The main source of bias due to confounding identified in these studies was confounding by indication, as following the clinical guidelines, patients received acrylic resin dentures as interim dentures in less favorable clinical cases or for economic reasons,[12,36,40,48] and not using appropriate statistical models to adjust for confounding variables. Domains that were deemed to be of low to moderate risk of bias included classification of intervention and selective outcome reporting.

Regarding level of evidence, the majority of included studies had a low level of evidence (level 4) based on the Oxford Center for Evidence-based Medicine tool.[11,12,36,40-50] Only one study had a higher level of evidence (level 2).[39]

All six studies that evaluated patient satisfaction were cross-sectional studies. Satisfaction was measured using Likert scale,[12,47-49] dichotomous scale,[46] or visual analog scale[50] (Table 2). Although these studies showed that there was no significant difference between acrylic resin and metal RPDs in patient satisfaction,[12,46-50] patients using the metal RPD were more satisfied than those using acrylic resin RPDs (Table 4).[12,46,49,50]

Three studies had missing outcome data. The authors were contacted but only one responded,[49] and therefore the other two studies were excluded from the meta-analysis.[47,48] The pooled SMD was 0.22 (z = 1.88, 95% CI: –0.01, 0.45, p = 0.06) in favor of metal RPD; however, this difference was not statistically significant. No statistical heterogeneity was found (I^2 = 0%, x^2 = 1.45, df = 2, p = 0.49), (Fig 2A).

The results of studies assessing OHRQoL are presented in Table 4. All included studies in OHRQoL outcome were cross-sectional,[11,36,40,42,44] except the study conducted by Montero et al, which was a cohort study with 1 month follow-up.[40] These studies used the validated Oral Health Impact Profile (OHIP) to assess OHRQoL, either in the short (OHIP-14)[11,36,40,42] or the longer (OHIP-20) format.[44]

Only studies that used OHIP-14 were included in the meta-analysis (n = 4).[11,36,40,42] The pooled mean difference for studies on OHRQoL was 1.45 (z = 0.73; 95% CI: –2.43, 5.33; p = 0.46), in favor of the acrylic resin RPD patients, but this was statistically not significant. Statistical heterogeneity was I^2 = 84% (x^2 = 18.65, df = 3, p = 0.0003) (Fig 2B).

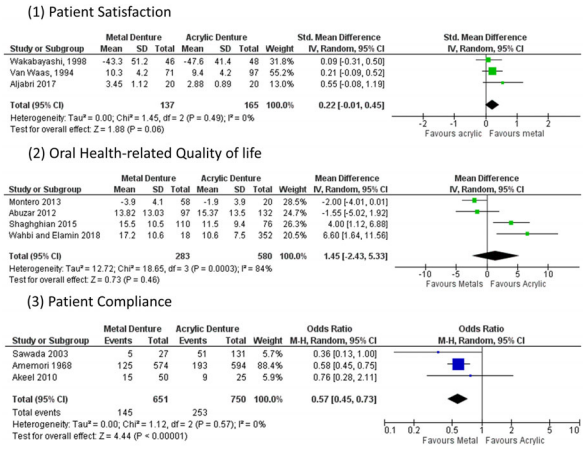

Figure 2 Meta-analysis of eligible studies comparing metal and acrylic resin removable partial dentures: (1) patient satisfaction, (2) oral health-related quality of life, and (3) patient compliance with denture wear.

Patient compliance with RPD treatment was assessed in three studies with cross-sectional design[41,43,45] (Table 2). In these studies, the RPD was considered unused when it was discarded, or it was used occasionally. To record patient compliance with RPD, one study used telephone interviews[43] and the other two studies used mailed questionnaires.[41,45] One study evaluated RPD use 1 year after RPD delivery[43] and the other two studies after 5 years.[41,45]

The percentage of unused RPDs after 5 years ranged from 32%[41] to 42%[43] for the acrylic resin patients and from 18.2%[45] to 30%[43] for the metal RPD patients (Table 4). The overall pooled odds ratio of RPD noncompliance was 0.57 (95% CI: 0.45, 0.73, $p < 0.0001$) and in favor of metal RPDs. Statistical heterogeneity was not found (I^2 = 0%, x^2 = 1.12, df = 2, p = 0.18) (Fig 2C).

The main reasons for RPD noncompliance regardless of RPD's type were pain, discomfort,[43,45] and defects in the abutment teeth, including carious lesions, periodontal diseases, or tooth loss.[41] Reasons for denture nonwear for metal versus acrylic resin dentures were not reported. Amemori et al found that pain and discomfort were the main reasons for short-term discarding of RPDs, but problems with abutment teeth or RPD fracture were the main causes of discarding dentures in the long term.[41]

Only one study assessed prosthesis preference and it was a crossover randomized trial.[39] Age range of patients (n = 15) was 18 to 60 years and 60% of patients were female. The study found that 14 of 15 patients (93.3%) preferred the metal RPD with bar major connector. No one preferred the metal RPD with plate major connector. This preference was explained in the study by the fact that 53% of patients (8/15) perceived that acrylic resin RPD interfered with speaking.[39] The follow-up time of this study was 5 days for each RPD followed by an additional 6 days for the preferred RPD.

Table 3 Risk of bias assessment of observational studies using ROBINS-I

Studies	Bias due to confounding	Selection of participants	Classification of intervention	Deviation from intended intervention	Missing data	Measurement of outcomes	Selection of the reported results
Patient satisfaction							
Wakabayashi	NI	Serious	Moderate	NA	NI	Critical	Low
Watson	NI	Serious	Moderate	NA	NI	Critical	Low
Zlataric, 2000	NI	Serious	Moderate	NA	NI	Critical	Low
Zlataric, 2003	NI	Serious	Moderate	NA	NI	Critical	Low
Van Waas	NI	Moderate	Moderate	NA	Serious	Critical	Low
Aljabri	NI	Critical	Low	NA	NI	Critical	Low
Oral health-related quality of life							
Abuzar	Critical	Serious	Serious	NA	NI	Moderate	Low
Shaghaghian	Serious	Serious	Low	NA	NI	Low	Low
Montero	Serious	Serious	Low	Moderate	NI	Low	Low
Ali	Critical	NI	Low	NA	NI	Low	Low
Elwahibi and Elamin	Critical	Low	Low	NA	NI	Low	Low
Patient compliance							
Akeel	NI	Low	Low	NA	Low	Low	Low
Sawada	Critical	Critical	Low	NA	Critical	Low	Low
Amemori	NI	Low	Low	NA	Critical	Moderate	Low

Abbreviations: NI, no information; NA, not applicable.

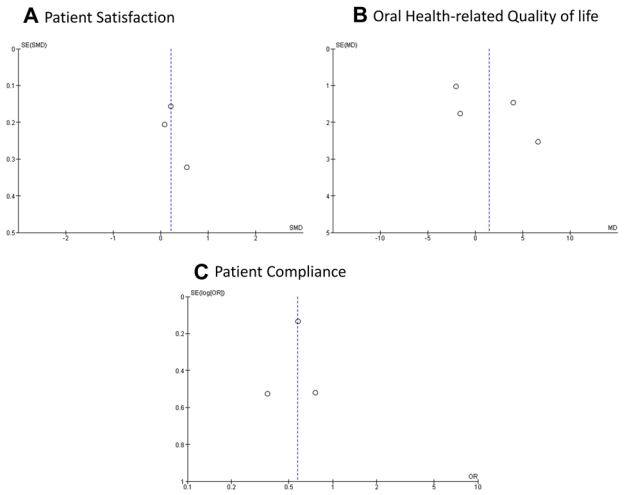

Figure 3 Funnel plots of the studies included in the meta-analysis: (A) patient satisfaction, (B) oral health-related quality of life, and (C) patient compliance.

To assess publication bias, funnel plots were constructed. Funnel plots were visually slightly asymmetrical (Fig 3), indicating the possibility of publication bias or a systematic difference between smaller and larger studies, i.e., the "small study effect."

Discussion

Although metal and acrylic resin RPDs have been extensively used in dentistry for a long time, few studies have been conducted to compare these two types of RPDs in terms of patient-reported outcomes.[39,40,49] This could be related to the fact that while patient-reported outcome research has gained popularity in oral health research, the interest in removable prosthodontics research has been decreasing for the past two decades.[17,18,20,51] To the best of our knowledge, this is the first systematic review to compare the difference between metal and acrylic resin RPDs in terms of patient-reported outcomes. The reviewed studies showed that the effect of the type of RPDs on patient-reported outcomes was inconsistent. Although the pooled estimate showed no statistically significant difference in patient satisfaction and OHRQoL, patients with metal prostheses had statistically significant higher compliance rates.[39,41,43,45] However, these studies had several major methodological issues and their conclusions should be taken cautiously.

Regarding patient satisfaction, included studies used satisfaction scales that had not been validated, and therefore the minimum important difference is unclear, making the clinical significance of these results difficult to interpret. All included studies showed that metal RPD wearers scored higher than acrylic resin RPD wearers; however, differences were not significant. Nonetheless, we must keep in mind that these statistical results might have been influenced by study design issues, such as inadequate statistical power and confounding by indication.[12,46-50] Further well-designed studies are needed to evaluate this outcome.

The pooled effect size of OHRQoL favors acrylic resin dentures, but it was not statistically significant and the effect size was (1.45, 95% CI: –2.34 to 5.33), which indicates inconclusive clinical effect when compared with the minimally important difference.[52] A previous study showed that while OHIP change scores are highly correlated with most aspects of patient satisfaction with prostheses, only satisfaction with chewing ability

Table 4 Results of the included studies

Study	Results
Watson et al, 1986	Higher proportions of metal RPD wearers were satisfied (71.4%) compared to acrylic resin RPD wearers (60%), but this was not statistically significant ($p > 0.05$)
Van Waas et al, 1994	Metal RPD wearers scored (10.3±4.2) higher satisfaction than acrylic resin RPD wearers (9.4 ± 4.2), but this was not statistically significant ($p > 0.05$)
Wakabayashi et al, 1998	Metal RPD wearers scored higher satisfaction than acrylic resin RPD wearers, but this was not statistically significant ($p > 0.05$)
Zlataric et al, 2000	No statistical significant difference in patient satisfaction between metal and acrylic resin RPD wearers ($p > 0.05$)
Zlataric et al, 2003	No statistical significant difference in patient satisfaction between metal and acrylic resin RPD wearers ($p > 0.05$)
Aljabri et al, 2017	Metal RPD wearers scored higher satisfaction (3.45) than acrylic resin RPD wearers (2.88), but this was not statistically significant ($p > 0.05$)
Montero et al, 2013	No significant difference between metal and acrylic resin RPDs in post-treatment OHRQoL scores after 1 month denture wear
Shaghaghian et al, 2015	Acrylic resin RPD wearers scored significantly better OHRQoL compared to metal RPD wearers ($p = 0.03$)
Abuzar et al, 2012	Metal RPD wearers scored better OHRQoL than acrylic RPD, but this was not statistically significant ($p = 0.388$)
Wahbi and Elamin, 2018	Acrylic resin RPD had significantly better OHRQoL compared to metal RPD wearers ($p = 0.001$)
Ali et al, 2017	Metal RPD wearers scored better OHRQoL than acrylic resin RPD wearers, but this was not statistically significant ($p = 0.15$)
Sawada et al, 2003	Metal RPD wearers scored better patient compliance compared to acrylic resin RPDs (OR = 0.36; 95% CI: 0.13, 1.00; $p = 0.050$), but this was statistically not significant
Amemori et al, 1968	Metal RPD wearers scored significantly better patient compliance compared to acrylic resin RPDs (OR = 0.58; 95% CI: 0.45, 0.75; $p < 0.001$)
Akeel, 2010	Metal RPD wearers scored better patient compliance compared to acrylic resin RPDs (OR = 0.76; 95% CI: 0.28, 2.11), but this was statistically not significant ($p = 0.514$)

Abbreviations: RPD, removable partial denture; OR, odds of denture nonwear.

and oral condition were the best predictors of OHIP change scores.[21] Further well-designed studies are needed in this topic.

One drawback of RPD treatment is the high rate of noncompliance.[36,43] Within the limits of our knowledge, this is the first systematic review in the field of removable dentures assessing patient compliance with RPD.[15] In the literature, about 19% to 36% of patients had discarded or occasionally used their metal RPDs,[36,43] a range similar to what was identified for the metal dentures in the studies included in this review.[41,43,45] The pooled estimate in this review indicated that metal RPDs were significantly associated with higher compliance compared to acrylic resin RPDs. However, as none of these studies explained the indications for metal and acrylic resin RPDs and they all have a cross-sectional design, it is expected that in all these studies, acrylic resin RPDs were provided to patients as interim prostheses for less favorable clinical cases following the current clinical practice,[5] which could bias the conclusion. Randomized controlled trials are recommended to explore the real effect of RPD on patient compliance.

Only one crossover trial evaluated RPD preference among metal and acrylic resin RPD wearers. Accordingly, the metal dentures were preferred in 93.3% of the cases.[39] However, in this study, the length of the follow-up was too short and did not consider adaptation period. Research suggests that patients' perception of their new denture fluctuates in the first 2 weeks after delivery but stabilizes at the end of the fourth week.[14] Therefore, further studies with a minimum of 6 months follow-up are recommended.

Caution should be considered in the interpretation of the results since several sources of bias and methodological issues have been identified in the included studies. This could explain the inconsistency and statistical heterogeneity in the findings as well. Most of the studies were cross-sectional[11,12,35,36,41-50] and had a low level of evidence.[53] Confounding by indication and questionable statistical power were identified in most of the studies included in this review.[11,12,35,36,40-50] To overcome these limitations, rigorous randomized clinical trials are needed.

In this review, the two oldest types of RPDs, cast metal and acrylic resin, were compared. Currently, different alternatives are available which include nonmetal thermoplastic resins, polyether ether ketone, as well as 3D printed metal and implant-assisted RPDs.[5,54] While the majority of these alternatives still lack extensive scientific evidence, implant-assisted RPDs have shown improved patient satisfaction and might change the practice of RPDs.[5,54-58] Also, a recent study by our group revealed that patient satisfaction with 3D printed RPDs is higher than with cast RPDs.[14] This observation, along with our findings here, could indicate that while currently available materials present comparable results, the manufacturing process of RPD might be a key factor in treatment success, and further research should be done in this area. Other treatment options to restore partial edentulism include fixed partial dentures and implant supported crowns, which despite their increasing success, might not be accessible to older patients with compromised general health and limited financial resources, rendering RPDs the best practical therapeutic option in many clinical scenarios.[54]

This review has several strengths: it included non-English literature, which broadens the scope of the review and could generalize the results to global populations. It also used recent and robust tools, such as ROBINS-I and the Cochrane Risk of Bias Assessment Tool for Randomized Controlled Trials, for the methodological assessment of the included studies. On the other hand, this review has some limitations, which include not reaching a definite conclusion due to the low quality and inadequate reporting of the included studies and the risk of publication bias, which is inherent in all systematic reviews.

Conclusion

The reviewed studies showed that there was no significant difference between metal and acrylic resin RPDs treatment in patient satisfaction and OHRQoL. Metal dentures were associated with higher patient compliance rates and were preferred more by patients compared to acrylic resin dentures. However, the reviewed studies had low level of evidence and therefore, high-quality randomized controlled trials are needed to conclusively address the question of this review.

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