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Adhesive precoated bracket systems and operator coated bracket systems

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Adhesive precoated bracket systems and operator coated bracket systems: Is there any difference?
A systematic review and meta-analysis

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ABSTRACT

Objectives: To investigate whether adhesive precoated brackets (APC) are more efficient than operator-coated brackets (OPC) regarding failure rate, bonding time, patient experience, gingival health, plaque accumulation, and white spot lesion formation.

Materials and Methods: Five online databases: Cochrane Central Register of Controlled Trials (CENTRAL), Scopus, PubMed, MEDLINE, and Web of Science were searched for potential eligible randomized controlled trials (RCTs). A Google Scholar and gray literature search was undertaken. References of included studies were screened for potential eligible studies. Results were collated from each database and modified Cochrane data extraction forms were completed. Quality assessment was performed using Cochrane RoB 2.0 tool for RCTs.

Results: Five studies met the inclusion criteria. All reported failure rates using metal brackets for both APC and OPC systems except one that compared clear APC to clear OPC. Three studies reported bonding time differences between the bracket systems. A quantitative synthesis of four studies reporting failure and three reporting bonding time was undertaken. Random effect meta-analysis determined there were no statistically significant differences in bond failures between bracket systems with an odds ratio of 0.890 ($P = .808$). Bonding time showed a statistically significant ($P = .01$) but not clinically significant shorter bonding time with OPC. There was insufficient evidence to assess plaque accumulation, gingival health, and either patient or operator experience.

Conclusions: There is no superiority of either bracket system regarding failure rate. OPC are statistically significantly superior over APC in bonding time although this is most likely not clinically significant. (*Angle Orthod.* 2019;89:495–504.)

KEY WORDS: Adhesive precoated brackets; Operator coated brackets; Pre-coated brackets

INTRODUCTION

Adhesive dentistry through bonding to enamel developed from the work of Newman,[1] which paved the way for the first successful bonding of plastic attachments to the surface of a tooth using an epoxy adhesive, and Buonocore's[2] work on pretreatment of the tooth surface. Orthodontists embraced this technology, moving from fully-banded appliances to bonded appliances, simplifying clinical procedures for fixed appliance therapy. Adhesive technology has continued to develop, aiming to reduce the bonding time while increasing the bond strength in addition to achieving a cost-effective and simpler bonding procedure. In 1991–1992, 3M introduced adhesive precoated brackets (APC) with the claimed clinical advantage of a reduction in failure rates due to improved control of the bracket and adhesive.[3] Multiple in vivo and in vitro studies, in addition to randomized clinical trials (RCTs), have compared the performance of APC and operator-coated bracket systems (OPC) but, to date, these have not been subjected to systematic review to provide the orthodontist with up to date evidence-based recommendations for clinical practice.

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MATERIALS AND METHODS

Review Question

The protocol for this systematic review was registered on the National Institute of Health Research Database: (http://www.crd.york.ac.uk/PROSPERO/display_record.php?ID=CRD42017081772).

Eligibility Criteria

Types of study designs considered in the review. Included studies were human prospective randomized controlled trials (RCTs).

Participants

Patients undergoing treatment with fixed orthodontic appliances with full upper and lower arch bracketing (an average of five brackets in each quadrant) were included.

Intervention

Adhesive precoated orthodontic brackets (APC).

Comparator

Operator-coated orthodontic brackets (OPC).

Outcome Measures

The outcome measures assessed the bracket failure rate, patient experience, bonding time, gingival health, plaque accumulation, white spot lesion formation, and operator experience.

Inclusion Criteria

• Only human prospective randomized controlled trials (RCTs) were included.
• Patients undergoing fixed appliance, full upper and lower arch bracketing with an average of five brackets in each quadrant.
• Study duration not less than 6 months.
• No language restriction or filters were applied and all articles were included (all articles that were collected were in the English language except one study was in French; however, the title and abstract were in English and it was excluded for nonrelevance; otherwise, a translator would have been used).
• The intervention APC and OPC were in the same study.

Exclusion Criteria

• Studies in which intervention and comparison were not included in the same research.

• Studies in which fewer than three brackets were bonded in each quadrant and/or full upper and lower arches were not bonded.
• Study duration of less than 3 months of bracket bonding.

Search Strategy

Five electronic databases: the Cochrane Central Register of Controlled Trials (CENTRAL), Scopus, PubMed, MEDLINE, and Web of Science, were searched individually by two reviewers to March 28, 2018, for potential eligible randomized clinical trials (RCTs). Reference lists of the included RCTs and other relevant articles related to the topic were checked for any additional relevant literature. Google Scholar, gray literature, and relevant orthodontic journals were searched to March 2018 for eligible studies. All terms used for each database search are shown in Appendix 1. The search was conducted with no restrictions regarding language, publication dates, or study design.

Study Selection

Potentially eligible studies and quality assessment of these studies were independently reviewed by two authors and any conflicts regarding study inclusion were resolved through discussion between the two authors. In the case of unclear studies after full-text reading affecting the eligibility decision, the study authors were contacted seeking clarification.

Data Collection Process

The Cochrane data collection form for interventional reviews of RCTs only (version 3, April 2014) was modified by the first and second authors to be suitable for this review. The data were collected independently by two authors and revised. Any disagreements were resolved by discussion and, if no agreement was reached, the third author would decide.

Data Items

Extracted information from the included trials were: (1) general information (date the form was completed, name/ID of person extracting the data, reference citation, study author contact details, and publication type); (2) study eligibility (study characteristics, type of study, participants, types of intervention, types of comparison, and types of outcome measures); (3) characteristics of the included studies (aim of study, design, unit of allocation, duration of participation, and ethical approval needed/obtained for study); (4) participants (population description, setting, inclusion criteria, exclusion criteria, method of recruitment of

participants, informed consent obtained, total number randomized, age); (5) intervention groups (group name, number randomized to group, duration of treatment period, providers, type of APC bracket, type of adhesive in APC bracket group, comparison, group name, number randomized to group, duration of treatment period, providers, type of noncoated bracket, and type of adhesive in noncoated group); and (6) outcomes (outcome name, time points measured, time points reported, outcome definition, total number of failure, person measuring/reporting, unit of measurement, imputation of missing data, and power).

Risk of Bias and Quality Assessment

The Cochrane Risk of Bias tool (RoB 2.0) for randomized clinical trials was used for quality assessment of the included studies. The included studies were reviewed against the following five main bias domains: bias arising from the randomization process, bias due to deviations from the intended interventions, bias due to missing outcome data, bias in the measurement of the outcome, and bias in the selection of the reported results. According to the Cochrane tool, the study was judged as low risk of bias if all the domains had the same result. High risk of bias was considered if the study had any domains judged at high risk of bias. In addition, a study was considered at high risk of bias if more than one domain scored some concerns in a way that raised doubts about the confidence of the results. During the quality assessment, the blinding of the operator in the studies was regarded as not feasible because of the nature of the interventions. The study scored some concerns if one or more domains were judged with some concerns. The quality assessment was conducted by two authors independently and any conflicts were solved by discussion. If the disagreement continued, a third author's opinion was obtained. When unclear domains were found altering the quality assessment decision, the study authors were contacted for clarification.

Summary Measures

Statistical heterogeneity was inspected using the I-squared and Tau-squared statistics. I-squared results greater than 50% represented moderate to high heterogeneity. While the estimate of variance among the studies in a random-effects meta-analysis, Tau-squared >1 meant that considerable statistical heterogeneity was present that affected the meta-analysis. Studies were eligible for quantitative synthesis if two or more reported the same outcomes using the same measurement unit within a comparable time frame. Otherwise, a qualitative synthesis was undertaken. For dichotomous data, the number of events and the sample sizes were pooled together to calculate the risk ratio (RR) with corresponding 95% confidence intervals. For the continuous data, the means with their corresponding standard deviations and sample sizes were aggregated to calculate the mean difference with corresponding 95% confidence intervals. A random-effects model was favored against the fixed model as it accounted for the possible existence of statistical or clinical heterogeneity.

Risk of Bias

The possibility of publication bias was to be assessed by both visual and formal evaluation using Egger's test and a funnel plot of the trial mean differences for asymmetry if more than 10 studies were included in the meta-analysis.[4]

Additional Analyses

The robustness of the overall results was assessed using sensitivity analysis to measure the impact of each individual study on the results. A sensitivity analysis was implemented using the one study removed method. Meta-analysis and sensitivity analysis were conducted using RevMan Meta-Analyses software version 5.3 assessing the bonding time difference between APC and OPC and Comprehensive Meta-Analysis (CMA) software version 3 (Biostat, Inc.) was used for the failure rate difference between the bracket systems.

RESULTS

Study Selection

Five trials were included in this review from the total of 1281 studies identified via the search strategy. Retrieved article titles and abstracts were screened resulting in the elimination and exclusion of 1243 studies. A total of 38 studies were considered potentially eligible and full texts were screened for the final inclusion and exclusion decision. Only five studies met the criteria set for the review and a total of 33 studies were excluded with the reasons recorded. No unpublished trials were retrieved (Figure 1).

Study Characteristics
Characteristics of the Included Studies

Trial setting (types of studies). All of the included studies were RCTs, and all of the study designs were split-mouth except Ash and Hay 1996,[5] which was a parallel two-group design. Three of the included studies were conducted in a hospital setting[5–7] and
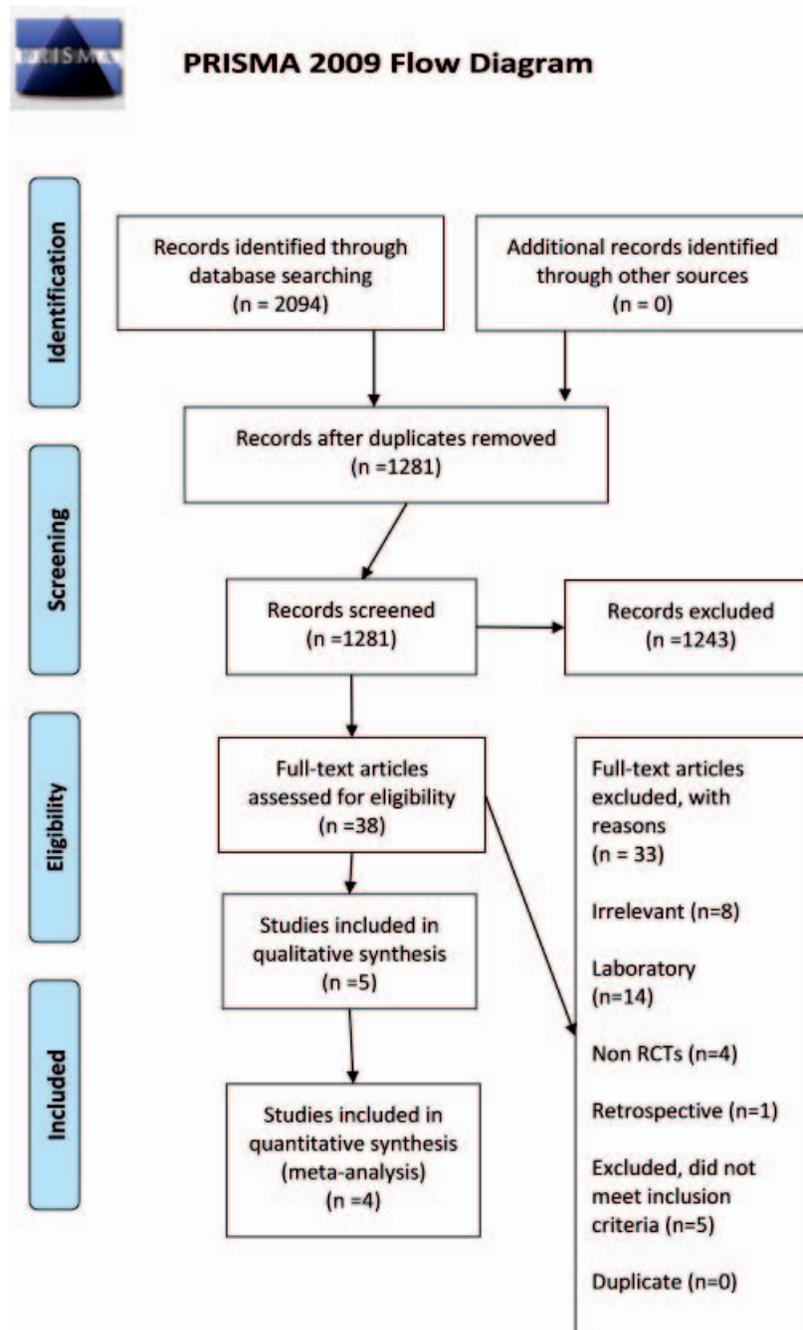
Figure 1. PRISMA flowchart showing the study selection process.

the others[8,9] were conducted in a university clinic setting.

Characteristics of the Participants

Three studies[5,6,9] recruited participants who sought orthodontic treatment with fixed appliances without age restrictions. However, Wong and Power[7] recruited participants under 18 years old, and Kula et al.[8] recruited participants 12–19 years of age (Table 1).

Characteristics of the Interventions and Comparison

All of the included studies' interventions were APC metal brackets compared to OPC metal brackets except Verstrynge et al.[9], who compared APC Clarity brackets to conventional OPC Clarity brackets. All of the studies used light-cured adhesives for both the APC intervention group and OPC comparison group except Sunna and Rock[6] and Ash and Hay,[5] who used

Table 1. Design, Observation Period, Interventions, and Outcome Measures of the Included Studies

Study Name	Type of Study and Study Design	Participants	Types of Intervention	Outcomes Measured	Duration of Study
Wong and Power,[7] 2003	Split-mouth RCT	Under the age of 18 years	Adhesive precoated orthodontic brackets	Bond failure rate Chairside time (bonding time)	6 mo
Ash and Hay,[5] 1996	Parallel RCT	Patients needing orthodontic appliances	Adhesive precoated group	Failure rate, bonding time, and flash remnant index	3 mo
Kula et al.,[8] 2002	Split-mouth RCT	12–19 y	APC group	Failure rate Flash remnant index	365 d
Verstrynge et al.,[9] 2004	Split-mouth RCT	Twenty patients requiring fixed orthodontic appliances	(APC) Clarity bracket	Failure rate	Debond
Sunna and Rock,[6] 1998	Split-mouth RCT	Forty patients with various malocclusions needing orthodontic treatment	Dynalock APC brackets	Failure rate of brackets Bonding time	12 mo

light-cured adhesives for the APC group and chemically cured adhesives for the OPC group.

Characteristics of the Outcomes

Failure rates. All of the studies reported failure of both brackets. One reported the failure at 12 months,[6] one reported the failure at 3 months,[5] and one reported the failure at 6 months.[7] Kula et al.[8] reported the failure at three different time points, namely at 3, 6, and 12 months. All of the studies reported the failure by bracket numbers and percentage except Ash and Hay,[5] who reported the failure by mean and standard deviation (Table 2).

Bonding Time

Only three of the five studies investigated the bonding time for APC and OPC.[5–7] All of the studies reported the bonding time in seconds per bracket except Wong and Power,[7] who reported the bonding time in seconds per two quadrants (Table 2).

Operator and Patient Experience, WSL, Plaque Accumulation, and Gingival Health

None of the included studies reported on these outcomes.

Synthesis of the Results

All five of the included studies reported failure between APC and OPC with conclusions of no clinical superiority between APC and OPC in terms of the bond failure except Ash and Hay,[5] who reported lower failure of APC compared to OPC ($P = .036$). Quantitative synthesis of four studies[5–8] indicated that there were no statistically significant differences in the bond failure between the systems, with an odds ratio of 0.890 ($P = .808$) (Figure 2). Quantitative synthesis of the three studies investigating the bonding time differences between APC and OPC[5–7] showed that there was a statistically significant difference favoring less bonding time with OPC ($P = .01$) (Figure 3). Heterogeneity was noted with an I^2 value of 77%.

Study name	Odds ratio	Lower limit	Upper limit	Z-Value	p-Value
Wong 2003	1.225	0.706	2.125	0.720	0.471
Ash 1996	0.283	0.196	0.409	-6.742	0.000
K KULA 2002	1.204	0.603	2.404	0.527	0.598
S.sunna 1998	1.666	0.822	3.377	1.417	0.157
	0.890	0.347	2.284	-0.243	0.808

Odds ratio and 95% CI

0.1 0.2   0.5   1   2   5   10
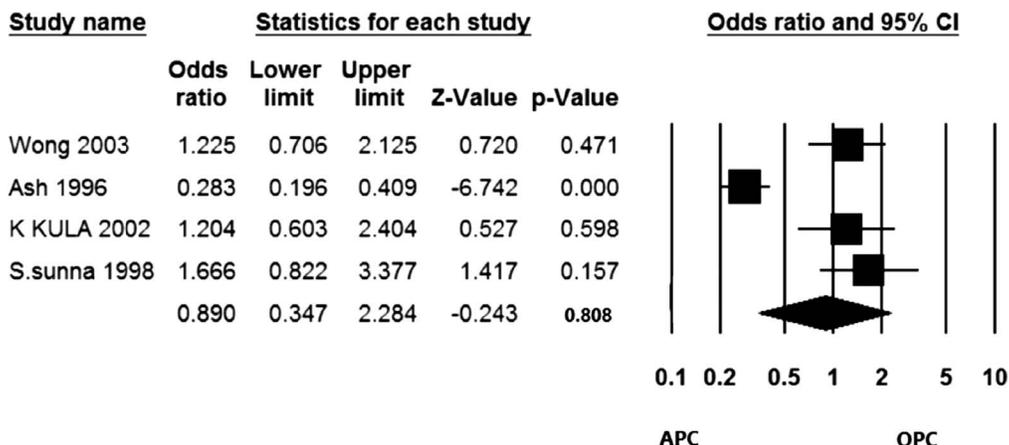
APC   OPC

Figure 2. Forest plot of the odds ratios of the failure between APC and OPC.

Table 2. Bond Failure Rates and Bracket Bonding Times

Study Name	Bracket Numbers	Failure Rate	Bonding Time
Wong and Power,[7] 2003	APC 372 OPC 374	APC 30 (8.06%) OPC 25 (6.68%)	APC mean = 52.9, SD = 69.26 s per two quadrants OPC mean = 50.9, SD = 72.47 s per two quadrants
Ash and Hay,[5] 1996	APC 42 quadrants OPC 38 quadrants	APC mean = 2.7% with SD = 6.1% OPC mean = 7.5% with SD = 7.7%	Mean = 83.4, SD = 19 s per bracket Mean = 75.5 with SD = 22.8 s per bracket
Kula et al.,[8] 2002	APC 232 brackets OPC 232 brackets	APC 19 (8.2%) OPC 16 (6.9%)	
Verstrynge et al.,[9] 2004	APC 40 quadrants OPC 40 quadrants	APC 0 OPC 0	
Sunna and Rock,[6] 1998	APC 128 brackets OPC 479 brackets	APC 12 brackets (9.4%) OPC Dynalock/ Transbond 4 of 147 total brackets (2.7%) OPC Dynalock/ Right-On 4 of 95 total brackets (4.2%) OPC Straight-wire/ Transbond 13 of 121 total brackets (10.7%) OPC Straight-Wire/ Right-On 7 of 116 total brackets (6%)	OPC Dynalock/Transbond mean = 92.48 SD = 19.74 OPC, Dynalock/Right-On mean = 53.67 SD = 16.05 OPC, Straight-Wire/Transbond mean = 93.92 SD = 20.15 OPC Straight-Wire/Right-On mean = 57.40 SD = 21.47 (all in s per bracket)

Risk of Bias within Studies

Only one study[9] was judged with a low risk of bias, an assessment enabled by author contact and clarification of the missing information. Four studies were judged as having some concerns, and three of these authors could not be reached to obtain the missing information. No study was scored as high risk of bias. The reviewers agreed that blinding the operator was not feasible due to the nature of the intervention and therefore it was not judged as a high risk of bias (Table 3).

Results of Individual Studies

The study using APC Clarity brackets compared to OPC Clarity brackets[9] reported failure to debond with zero failure of the brackets.

Additional Analyses

Heterogeneity was detected with an I^2 value of 91.28. Sensitivity analyses was implemented by removing one study.[5] Heterogeneity then dropped to zero with an I^2 value of 0.000 (Figure 4).

DISCUSSION

Summary of Evidence

The results of this systematic review are the first on this topic and as such there were no others for comparison (Table 4). The search strategy used keywords, MeSH terms, and (OR) Boolean operators instead of (AND), which yielded a large amount of literature and ensured that all potentially eligible literature was retrieved. All of the studies included in this review were prospective RCTs with high-quality evidence. All of these studies were split-mouth RCTs except one study[5] that was a parallel-group RCT. A split-mouth RCT study design was considered a good choice of study design for this intervention for multiple reasons. It eliminated multiple factors that could have affected the outcomes such as patient habits, type of malocclusion, and the oral environment surrounding the brackets, and a smaller sample size was required, almost half the number required compared to a parallel RCT study design. Conversely, the most important drawbacks of split-mouth studies are the crossover effects. Patient dropouts also have an impact on the quality of research. A critical appraisal using the Cochrane RoB 2.0 tool led to all of the included studies being judged as having some concerns except Verstrynge et al.[9] (Figure 5), which was assessed as a low risk of bias in part because the author was contacted and clarification of the missing information was obtained. Three study authors could not be
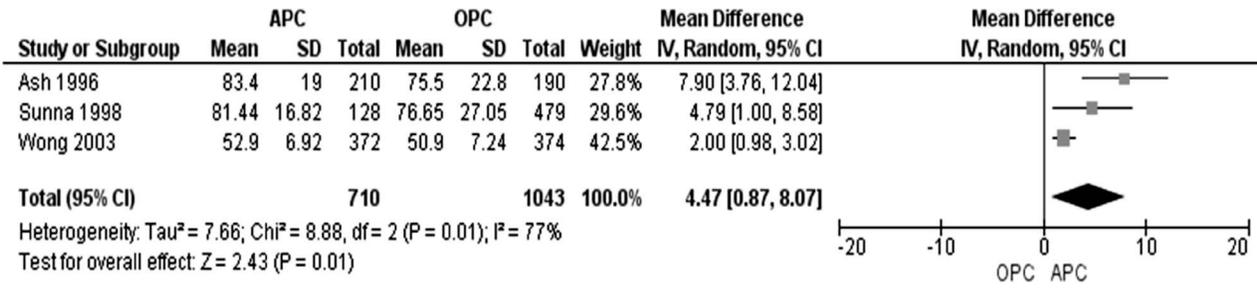
Study or Subgroup	APC			OPC			Weight	Mean Difference IV, Random, 95% CI
	Mean	SD	Total	Mean	SD	Total		
Ash 1996	83.4	19	210	75.5	22.8	190	27.8%	7.90 [3.76, 12.04]
Sunna 1998	81.44	16.82	128	76.65	27.05	479	29.6%	4.79 [1.00, 8.58]
Wong 2003	52.9	6.92	372	50.9	7.24	374	42.5%	2.00 [0.98, 3.02]
Total (95% CI)			710			1043	100.0%	4.47 [0.87, 8.07]

Heterogeneity: Tau² = 7.66; Chi² = 8.88, df = 2 (P = 0.01); I² = 77%
Test for overall effect: Z = 2.43 (P = 0.01)

Figure 3. Forest plot mean differences of bonding time between APC and OPC.

reached to retrieve missing data.[6–8] Most of the bias arose from missing information about assessor blinding.[6–8] Two authors of the five studies were contacted and the missing information was obtained.[5,9.] However, the methods of randomization in Ash and Hay's study were not clear even after contacting the authors.

The overall assessment of the evidence was rated as moderate quality according to Grade due to the limitations of the study design, the methods of randomization in some of the studies, and the blinding of the outcome assessor. All of the studies reported that there were no clinically significant differences between the APC and OPC systems regarding failure and these results were confirmed by quantitative synthesis. The quantitative synthesis was possible for all of the studies except one,[9] which investigated clear ceramic APC brackets and clear ceramic OPC brackets. However, the other four studies used metal brackets. Verstrynge et al.'s study was considered ineligible for quantitative synthesis because of the differences in the bond strengths and the bonding between the brackets and the tooth surfaces using metal and ceramic brackets. All of the studies reported increased failure in the premolar area compared to the anterior teeth. Sunna and Rock[6] used a removable appliance to raise the occlusion to avoid failure resulting from biting on the brackets but claimed that this would not make a difference in the results as the trial had a split-mouth study design. Two of the included studies[7,8] compared APC and OPC brackets using light cured adhesive, while one[5] compared APC with light-cured adhesive to chemically cured adhesive OPC. Sunna and Rock compared two types of APC metal brackets with light-cured adhesive to a combi-

nation of OPC brackets with chemically cured and light cured adhesive.

The heterogeneity that arose from the inclusion of Ash and Hay's study was likely due to the low number of APC bracket failures in contrast to the results of the other studies, which reported increased numbers of failures for APC.

The results showed a statistically significant difference indicating the superiority of OPC bracket systems over APC systems due to less bonding time. The difference was approximately 4 seconds per bracket between the two systems. The results should be cautiously interpreted as the bonding time difference between the chemically cured OPC adhesive system and the light-cured adhesive OPC system was approximately 25 seconds in Sunna and Rock's study.[6] All of the APC bracket systems used light-cured adhesive while the OPC bracket systems included both light-cured adhesive and chemically cured adhesive, which could in itself have favored the OPC systems in time per bracket. Wong and Power compared APC and OPC bracket systems that both used light-cured adhesive, while Ash and Hay compared APC with light-cured adhesive to OPC with chemically cured adhesive. Sunna and Rock[6] compared a combination of chemically cured and light-cured adhesive OPC bracket systems to an APC system with light-cured adhesive. Wong and Power reported results with a substantial difference compared to the other two studies.[5,6] Wong and Power[7] reported bonding time for APC with a mean value of 52.9 seconds, while these values were 83.4 and 81.44 seconds for Ash and Hay and Sunna and Rock,[5,6] respectively. Also, Wong and Power reported bonding

Table 3. Risk Of Bias in the Included Studies

Study Name	Randomization Process	Deviations From Intended Interventions	Missing Outcome Data	Measurement of the Outcome	Selection of the Reported Results
Wong and Power,[7] 2003	Low	Low	Low	Some concerns	Low
Ash and Hay,[5] 1996	Some concerns	Low	Low	Some concerns	Low
Kula et al.,[8] 2002	Some concerns	Low	Low	Some concerns	Low
Verstrynge et al.,[9] 2004	Low	Low	Low	Low	Low
Sunna and Rock,[6] 1998	Low	Low	Some concerns	Some concerns	Low

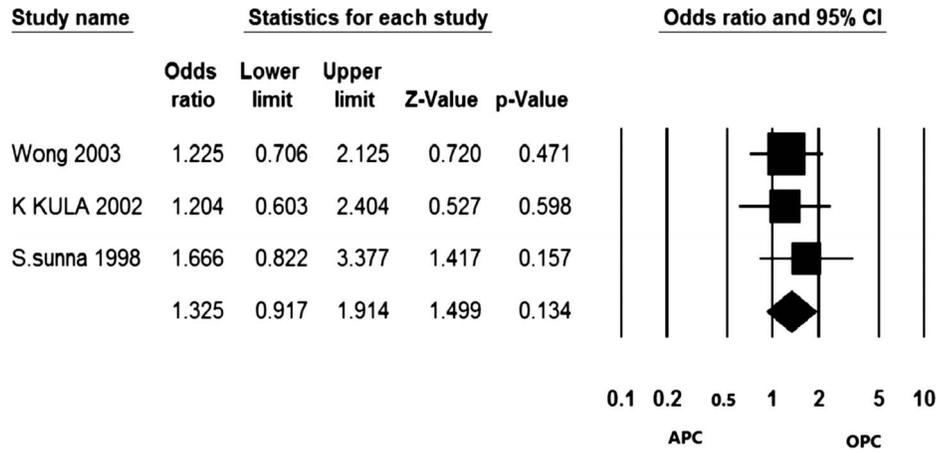| Study name	Statistics for each study					Odds ratio and 95% CI
	Odds ratio	Lower limit	Upper limit	Z-Value	p-Value	
Wong 2003	1.225	0.706	2.125	0.720	0.471	
K KULA 2002	1.204	0.603	2.404	0.527	0.598	
S.sunna 1998	1.666	0.822	3.377	1.417	0.157	
	1.325	0.917	1.914	1.499	0.134	

Figure 4. Forest plot of the odds ratios of the failure between APC and OPC after applying a sensitivity test by removing one study.

time for OPC brackets with light-cured adhesives with a mean of 50.9 seconds compared to 92.48 and 93.92 seconds for OPC light-cured adhesive brackets in Sunna and Rock's study.[6] These differences led to increased heterogeneity in the results, with an I^2 value of 77%. It should be recognized that all of the included studies were published more than 10 years ago, which explains the variety of curing techniques seen, and contemporary light curing for both APC and OPC is likely to reduce the difference observed here. Therefore, it may be concluded that the statistically significant difference in time is likely to not be clinically significant.

There was no literature discussing plaque accumulation, gingival health, or patient and operator experience outcomes. This was disappointing as these all influence bracket choice. In addition, there was no cost analysis, which could be a factor in the choice of an APC system. This review clearly showed no time benefit in using APC systems, but it is possible that an indirect cost saving could be made if less chairside assistance is required when using an APC system.

Limitations

The main limitation in drawing conclusions was the small number of studies included in the review. This was due to restricting the included studies to RCTs, although this was to ensure that only high-quality evidence was included. This meant that the range of adhesives included was limited and did not represent

all of the currently available alternatives, and that APC I, APC II, and APC PLUS were regarded as a single group and difference in performance between them cannot be identified. The quality assessment of some of the included studies could have been regarded as low risk of bias if the authors could have been contacted. Three outcomes revealed no evidence investigating them in the included studies.

Implications for Practice

It is recommended that operators use either system as there is no difference between the bracket systems regarding failure. There is also no clinically significant benefit of using either bracket system regarding bonding time. In the process of full-arch bonding with an average of five brackets per quadrant, there would be an approximately 80-second difference in total bonding duration.

Implications for Research

Age restriction of the participants should not be applied as fixed appliance therapy and bracket failure is not limited to specific ages. Approximately 90% of bracket failures occur within the first 3 months.[10] However, it is recommended that the duration of observation be 12 months. Operator experience should be clearly recorded with one operator undertaking the entire bonding process to avoid operator bias. A clear statement of the dropouts and the numbers of patients and brackets at the start and end of treatment with

Table 4. Summary of Findings

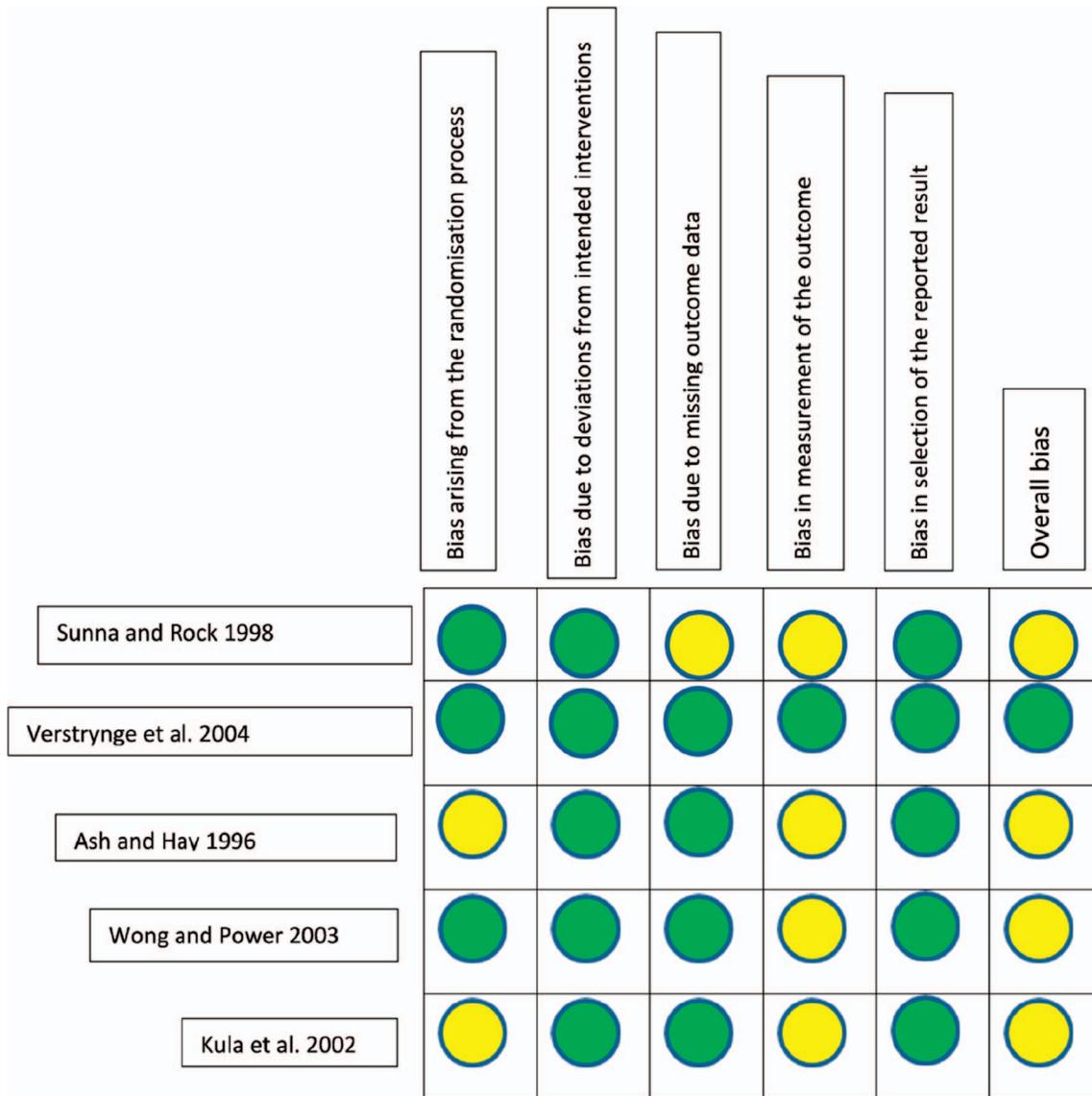| APC vs OPC	Failure Rate	Bonding Time	Plaque Accumulation, Gingival Health, and Patient Experience	Operator Experience
Result	No significant difference between APC and OPC	Significant difference with less bonding time with OPC vs APC	No results could be obtained	No results could be obtained
P value	.890	.01		

Figure 5. Risk of bias for the included RCTs.

appropriate statistical analysis should be included. Peri-bracket decalcification and white spot lesions should be recorded as secondary outcomes along with plaque index and gingival health. Both operator and patient feedback should be included.

CONCLUSIONS

Moderate quality evidence from this review supports the following conclusions:

- There is no superiority of APC over OPC bracket systems regarding the failure rate of the brackets.
- OPC bracket systems have significant statistical superiority over APC bracket systems in bonding time; however, this is not regarded as clinically significant.

- More well-conducted trials are necessary regarding patient experience, gingival health, plaque accumulation, white spot lesions, and operator experience.
- Most of the evidence in this research could be judged as low risk of bias, increasing the quality of evidence, if the authors of the included studies could be contacted.

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Appendix

Database	Search Strategy/Keywords	Results
Cochrane	(precoated OR pre-coated OR "pre coated" OR uncoated OR noncoated OR non-coated OR "operator coated" OR operator-coated) AND (bracket OR brackets OR dental bonding OR fixed appliances) Search: Title/abstract/keywords	42
MEDLINE	(MH "Dental Bonding") OR (MH "Dental Cements") OR (MH "Orthodontic Appliances") OR (MH "Orthodontic Brackets") AND (pre-coated OR "pre coated" OR coated OR uncoated OR noncoated OR non-coated OR "operator coated" OR operator-coated OR "pre coated brackets")	584
PubMed	(("Dental Bonding" [MeSH] OR "Dental Cements" [MeSH]) OR ("Orthodontic Brackets" [MeSH] OR "Orthodontic Appliances" [MeSH])) AND (pre-coated [all fields] OR "pre coated" [all fields] OR coated [all fields] OR uncoated [all fields] OR noncoated [all fields] OR non-coated [all fields] OR "operator coated" [all fields] OR operator-coated [all fields])	1161
Scopus	("dental bonding" OR "dental cements" OR "Orthodontic adhesives" OR "Orthodontic brackets") AND (Precoated OR Pre-coated OR "Pre coated" OR Uncoated OR Non-coated OR "Operator coated" OR Operator-coated OR "coated brackets") Search: Title/Abstract/keywords	141
Web of Science	("dental bonding" OR "dental cements" OR "Orthodontic adhesives" OR "Orthodontic brackets") AND (Precoated OR Pre-coated OR "Pre coated" OR Uncoated OR Non-coated OR "Operator coated" OR Operator-coated OR "coated brackets" OR coated) Search: topic	160