JOURNAL OF DENTISTRY 43 (2015) 934–954

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.intl.elsevierhealth.com/journals/jden

Review

Longevity of posterior resin composite restorations in adults – A systematic review

Álfheiður Ástvaldsdóttir [a,*], Jessica Dagerhamn [b], Jan W.V. van Dijken [c], Aron Naimi-Akbar [a], Gunilla Sandborgh-Englund [a], Sofia Tranæus [a,b,d], Mikael Nilsson [b,d]

[a] Department of Dental Medicine, Karolinska Institutet, Huddinge, Sweden
[b] Swedish Council on Health Technology Assessment, Stockholm, Sweden
[c] Department of Odontology, Dental School Umeå, Umeå University, Umeå, Sweden
[d] Faculty of Odontology, Malmö University, Malmö, Sweden

ARTICLE INFO

Article history:
Received 23 December 2014
Received in revised form
1 May 2015
Accepted 2 May 2015

Keywords:
Clinical
Composite
Effectiveness
Longevity
Resin
Systematic review

ABSTRACT

Objective: To conduct a systematic review of the literature on the longevity of posterior resin composite restorations in adults.

Material and methods: A systematic literature search was conducted according to predetermined criteria for inclusion and exclusion. The studies selected were prospective clinical trials with a minimum follow-up time of 4 years, 40 restorations per experimental group and an annual attrition rate of less than 5%. Initially, abstracts and full-text articles were assessed independently and the assessment was subsequently agreed on by five reviewers. The methodological quality of the studies was assessed according to the Swedish Council on Health Technology Assessment (SBU) standard checklist for determining the extent to which studies meet basic quality criteria.

Results: In all, the literature search identified 4275 abstracts and 93 articles were read in full-text. There were eighteen studies which met the criteria for inclusion, eight of which were included in the analysis. There were 80 failures of restorations with a total follow-up time at risk for failure of 62,030 months. The overall incidence rate for all causes of failure was 1.55 lost restorations per 100 restoration years. The most common biological reason for failure (a total of 31 restorations) was secondary caries, with or without fracture of the restoration. The quality of the evidence was low.

Conclusions: In an efficacy setting, the overall survival proportion of posterior resin composite restorations is high. The major reasons for failure are secondary caries and restoration fracture which supports the importance of adequate follow-up time.

Clinical significance: The overall survival proportion of posterior composite restorations was high, but the results cannot be extrapolated to an effectiveness setting. The importance of adequate follow-up time is supported by the finding that secondary caries often occurred after 3 years or later.

* *Corresponding author at:* Division of Cariology, Department of Dental Medicine, Karolinska Institutet, Alfred Nobels allé 8, 141 04 Huddinge, Sweden. Tel.: +46 8 524 88035.
E-mail address: Alfheidur.Astvaldsdottir@ki.se (Á. Ástvaldsdóttir).
http://dx.doi.org/10.1016/j.jdent.2015.05.001
0300-5712/

1. Introduction

A range of materials is available for restoration of posterior teeth. In recent years, amalgam, once the predominant restorative material, has successively been replaced by tooth-coloured materials,[1–3] offering such advantages as aesthetics and less invasive preparation techniques. Dental restorations, however, have a limited lifespan and replacement of a failed restoration leads to an increase in cavity size and destruction of tooth substance.[4,5] Placement and replacement of restorations is still the most common procedure in general dentistry, representing an enormous annual expense.[2,6] Improving the longevity of restorations is therefore an important aim in dentistry.

A higher annual failure rate has been reported for posterior resin composite restorations than for amalgam.[1–3,7,8] A recent Cochrane review, evaluating trials which compared resin composite with amalgam restorations in posterior permanent teeth, showed that resin composite restorations had a significantly higher risk of failure than amalgam, with increased risk of secondary caries, but no evidence of increased risk of restoration fracture.[9]

The longevity of restorations is influenced by a number of factors,[10,11] such as the considerable differences in mechanical, physical, adhesive and handling properties of the various resin composites and adhesive systems. The patient, socio-economic factors, the oral environment, including the location and size of the restoration, caries risk and habits such as bruxism also influence the survival of restorations.[10,12] A major factor is the clinician, who makes the decision to restore the tooth or replace a restoration, selects the material and undertakes the treatment.[10,13] Commercially, the life span of restorative materials is limited and in recent years conventional hybrid materials have been superseded by nanohybrid resin composites. At the same time, clinicians are increasingly adopting simplified adhesive systems.[14,15] From a dental material perspective, the generalizability of the results from earlier studies is therefore problematic.

The aim of the present review was to assess systematically the longevity of posterior resin composite restorations in adults, as reported in prospective clinical trials of satisfactory quality.

2. Materials and methods

2.1. Inclusion and exclusion criteria

Inclusion and exclusion criteria for the selection of papers for review were established prior to the literature search and are shown in Table 1. Inclusion criteria consisted of prospective controlled trials of Class I and/or Class II resin composite restorations with follow-up times of 4 years or more, with at least forty restorations per experimental group, in adult patients with dropout rates of less than 5% per year. Retrospective studies and reviews were excluded.

2.2. Literature search and selection of articles

The electronic search included PubMed, Cochrane Library and the databases of the Centre for Reviews and Dissemination from 1990 to December 2011. An updated search of the same databases was conducted in March 2013 and on this occasion the Trip Database was also included.

A combination of free text and MeSH terms was used (Table 2). In PubMed a filter was used to identify randomized controlled trials. No language restrictions were applied. The abstracts were evaluated independently by the 5 reviewers, according to predetermined inclusion criteria. Any disagreement about inclusion was solved by consensus. If a reviewer was co-author of a paper, the evaluations were conducted by other reviewers. Articles in English, German, Danish, Norwegian and Swedish were accepted. Full text articles not fulfilling the inclusion criteria were excluded from further analysis.

Table 1 – Criteria for inclusion and exclusion.

Inclusion criteria	
Study design	Prospective RCT
	Prospective CCT
	Prospective observational study without comparison group
Observation time	≥4 years
Participants (number and age)	≥40 individuals/teeth (18+ years) in each groups
Attrition	≤5%/year and described
Exclusion criteria	
Problem specification	Problem specification not addressed
	Primary outcome not analyzed
Sample characteristics and size	Advanced sample, not treated in GDP
	All teeth endodontically treated
	Sample characteristics unclear
	Number of subjects in each group <40
	Impossible to analyze number of subjects followed for ≥5 years
	Attrition >20% after 4 years and then additionally >5% per year or not described
	Accrual period >5 years or not reported
	Observation time <4 years
Publication issues	Published <1990
	Not original research (editorial, review, etc.)
	Case report

2.3. Rating quality of individual studies

The methodological quality of the studies was assessed according to the Swedish Council on Health Technology Assessment (SBU) standardized checklists for determining the extent to which studies meet basic quality criteria.[16] The criteria assess risk for selection bias, performance bias, detection bias, attrition bias and reporting bias. The quality of included studies (i.e. risk of bias) was rated as high, moderate or low. Only studies with moderate to low risk of bias were considered for grading of scientific evidence and conclusions. Any disagreements on quality rating of individual studies were resolved within the group of reviewers by consensus. Reviewers who were also authors or co-authors of studies under evaluation were excluded from participating in the quality rating process.

2.4. Grading the scientific evidence across studies

The quality of the scientific evidence supporting the reported outcomes was rated on a four-point scale according to GRADE.[17]