How long do routine dental restorations last: a systematic review

Authors' objectives
The paper provides a condensed version of the full review (see Other Publications of Related Interest no.1), the objectives of which were to conduct a systematic review of the literature on the longevity of routine dental restorations in permanent posterior teeth, and to identify and examine factors influencing its variability.

Searching
MEDLINE, EMBASE, CINAHL, Dissertation Abstracts and ERIC databases were searched from inception, together with ISTP. Conference proceedings were searched using SCISEARCH. The subject headings used included: 'dental restoration', 'longevity', 'failure', 'durability', 'survival analysis' and 'life table analysis'. There was no language restriction. The Cochrane Controlled Trials Register in the Cochrane Library (1998 issue 2) was also checked for trials. Bibliographic lists of the retrieved literature were handsearched. Key authors in the subject area were contacted to obtain grey literature. Retrospective handsearching of all studies by key authors identified in the review was carried out and cross referencing performed with studies identified from previous search strategies.

Study selection
Study designs of evaluations included in the review
Studies with a period of observation of at least five years were considered.

Studies reported in the review included six retrospective longitudinal studies, one longitudinal prospective study and one non-randomised controlled trial.

Specific interventions included in the review
Class I (occlusal) and Class II (mesial-occlusal, distal-occlusal, mesial-occlusal-distal) restorations in permanent teeth. Simple amalgam, composite resin, glass ionomer and cast gold restorations were included.

Participants included in the review
Patients requiring dental restorations in the permanent posterior teeth. No further details given regarding the participants.

Outcomes assessed in the review
Appropriate measure of longevity of the restoration. A formal statistical analysis of survival such as life table or product-limit (Kaplan Meier) estimates of survival functions, median survival time (MST) or median longevity, cumulative survival rate, survival/failure rate.

How were decisions on the relevance of primary studies made?
The studies were assessed independently by five investigators. The degree of blinding on the part of the assessors was not stated. The level of agreement between the investigators was tested by calculating kappa values. Studies that were agreed upon by three or more investigators were selected for prospective inclusion.

Assessment of study quality
A checklist of eight characteristics was used to assess the validity of the studies. Characteristics recorded were: randomisation in sampling, calibration of the examiners, clarity in defining the terms failure and survival of the restorations, clarity of the criteria for replacement, consideration of the effect modifiers, if the assessment was based on clinical examination, consideration of the effect of censoring data and the appropriateness of the outcome measure used. Studies were graded as either meeting ('Yes') or failing ('No') on each of the validity criteria. Only studies with a score of six 'yes' ratings or above, using these criteria, were included in the review. It is not clear how many investigators were involved in assessing study validity.
Data extraction
Data were extracted for the design type, practice setting, effect modifiers considered, materials investigated, random sampling, period of observation, appropriate analysis and the main findings of the study. Data extraction was performed by the principal researcher. Reliability of data extraction was rechecked and any disagreements referred to the advisory group for final decision.

Methods of synthesis
How were the studies combined?
A narrative synthesis of the study findings was presented.

How were differences between studies investigated?
No formal test of heterogeneity was performed. The authors do report the varying quality and presentation of the results that precluded formal statistical combination of the studies.

Results of the review
Fifty-eight studies met the inclusion criteria. Of these only eight were eventually considered to be of adequate quality and were included in the review.

The main outcome measure reported in the eight reports judged of adequate quality was median survival time (MST). From the results, 50% of all restorations expected to survive between 10 and 20 years. For amalgam restorations, the results suggested a range of 50% survival from a low of 5-8 years to around 23 years. For other filling materials, the findings were conflicting. One of the studies reported a MST of 17 years for composite restorations and 14 for cast gold. This study also showed that durability of glass ionomer was less than that of composite resin and it should not be considered for posterior occlusal or approximal restorations.

Restoration type, materials, the patient, the operator, the practice environment and type of care system appeared to influence longevity. The authors emphasise a high degree of variation amongst the studies that precluded any formal pooling.

Authors' conclusions
The authors conclude that many studies were imperfect in design. Those considered to be the most appropriate for analysis were too limited to undertake a formal statistical exploration. The authors conclude the need for definitive randomised controlled trials of restoration longevity, of sound design and adequate power, employing standardised assessments and appropriate methods of analysis.

CRD commentary
The scope of the review and the question were clearly defined. The literature search was comprehensive but the date to which the literature was searched was not given. The issue of publication bias was also not addressed. The studies were assessed for their relevance and quality, and their data were extracted in a systematic way using multiple reviewers to avoid bias. Study details were adequate. However, details regarding number of participants and their age etc were not given.

Although, the validation of studies was done adequately, the studies included had widely differing designs and this precluded the comprehensive synthesis and presentation of the results. The authors report that 50% of all restorations can be expected to survive between 10 and 20 years. It is not clear how the authors have come to this conclusion from the given results. There was no tabulation of results from the original studies to show the statistical exploration of factors influencing longevity.

The authors recognised the limitations of the review given the variability in the quality and design of the studies included.
Implications of the review for practice and research

Practice: The authors did not state any implications for practice.

Research: The authors point out the need for definitive randomised controlled trials of restoration longevity, of sound design and adequate power, employing standardised assessments and appropriate methods of analysis.

Bibliographic details


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Other publications of related interest


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This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.