



Repair or replacement of restorations

A prospective cohort study by dentists in The National Dental Practice-Based Research Network

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The longevity of restorations and the cost of replacing restorations are 2 significant factors determining the long-term cost of restorative therapy. Many factors affect the longevity of restorations, including the restoration quality at the time of insertion; the type and size of the restoration; the restorative material involved; practitioner's knowledge and experience in secondary caries diagnosis; patient factors such as oral hygiene, patient's age, dentition, and caries risk; and if the patient maintains regular recall appointments in the same dental practice.¹⁻⁶ Most failures occur several years after the restoration was placed, and they are a result of gradual development of secondary caries, some physical defects, such as fracture of restoration or tooth or discoloration of the restoration, or some form of degradation, such as marginal breakdown or "ditching."⁷

Repair of defective restorations rather than replacement of the entire restoration

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ABSTRACT

Background. A prospective cohort study that included dentists in The National Dental Practice-Based Research Network was conducted to quantify 12-month failures of restorations that were repaired or replaced at baseline. The study tested the hypothesis that no significant differences exist in failure percentages between repaired and replaced restorations after 12 months. It also tested the hypothesis that certain dentist, patient, and restoration characteristics are significantly associated with the incidence of restoration failure.

Methods. Dentists recorded data for 50 or more consecutive defective restorations. The restorations that were either repaired or replaced were recalled after 12 months and characterized for developing defects.

Results. Dentists (N = 195) recorded data on 5,889 restorations; 378 restorations required additional treatment (74 repaired, 171 replaced, 84 teeth received endodontic treatment, and 49 were extracted). Multivariable logistic regression analysis indicated that additional treatment was more likely to occur if the original restoration had been repaired (7%) compared with replaced (5%) (odds ratio [OR], 1.6; $P < .001$; 95% confidence interval [CI], 1.2-2.1), if a molar was restored (7%) compared with premolars or anterior teeth (5% and 6%, respectively) (OR, 1.4; $P = .010$; 95% CI, 1.1-1.7), and if the primary reason was a fracture (8%) compared with other reasons (6%) (OR, 1.3; $P = .033$; 95% CI, 1.1-1.6).

Conclusions. An additional treatment was more likely to occur within the first year if the original restoration had been repaired (7%) compared with being replaced (5%). However, repaired restorations were less likely to need an aggressive treatment (replacement, endodontic treatment, or extraction) than replaced restorations.

Practical Implications. One year after repair or replacement of a defective restoration, the failure rate was low. However, repaired restorations were less likely to need an aggressive treatment than replaced restorations.

Key Words. Longevity; practice-based research; repair; replacement; decision; defective; restorations; cohort.

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has been a somewhat controversial treatment. The major advantage of repair treatment is that it saves tooth structure⁸⁻¹² and patient chair time. It also places minimal stress on the pulp of the tooth. The approach, therefore, is consistent with the concept of minimally invasive dentistry. However, because it has not been widely accepted as an alternative treatment, not many clinicians have incorporated this practice into routine care.¹³ Therefore, assessing the clinical survival of this treatment, especially in the first 12 months after treatment, is of paramount importance.

Longitudinal studies that assess failure of existing restorations and explore the reasons for failure may provide information to increase the longevity of restorations.⁷ Restorations placed in practice-based studies provide a unique opportunity for following up on these restorations in a real-world setting—the ultimate test of dental restorations, as the clinical conditions are not controlled.¹⁴ The information gathered from a practice-based setting may improve the longevity of restorations over time, as clinicians can learn the outcome of both types of treatments and hopefully make a decision based on evidence from actual treatment of existing defective restorations. Therefore, the aims of this study were to quantify the annual failure rate of restorations that were repaired or replaced at baseline, test the hypothesis that there is no significant difference in longevity of restorations that have been either repaired or replaced, and test the hypothesis that some dentist, patient, and restoration characteristics are significantly associated with the incidence of restoration failure.

METHODS

This prospective cohort study included 195 dentists of the Dental Practice-Based Research Network (DPBRN) that existed from 2003 to 2012 with a grant from the National Institute of Dental and Craniofacial Research, National Institutes of Health.¹⁵ DPBRN subsequently evolved into The National DPBRN, a consortium of dental practices and dental organizations focused on improving the scientific basis for clinical decision making. The data for this study were collected under the auspices of the DPBRN from 2008 to 2009, and the manuscript of this article was prepared under the aegis of The National DPBRN.

At the time of this study, the network was composed primarily of clinicians from 5 regions: Alabama/Mississippi (AL/MS); Florida/Georgia (FL/GA); Minnesota (MN), either employed by HealthPartners in Bloomington, MN, or in private practice; Permanente Dental Associates (PDA), in cooperation with Kaiser Permanente's Center for Health Research in Portland, OR; and Denmark, Norway, and Sweden (SK). Each of the 195 participating dentists recorded data for 50 or more consecutive restorations deemed defective during clinical visits. Practice structures differed somewhat by network region. Dentists

from the AL/MS and FL/GA regions were primarily from solo or small group practices (SP), HealthPartners and PDA are large group practices (LGP), and SK dentists were from solo or small group private practices (SP), or public health care settings (PHS). Results from previous studies confirm that dentists in practice-based research networks have much in common with dentists at large.^{16,17} The institutional review boards of each participating region approved the study.

Network dentists were recruited through continuing education courses or mass mailings to licensed dentists within the participating regions. As part of the eligibility criteria, all dentists completed an enrollment questionnaire describing their demographic and practice characteristics as well as certain personal characteristics, an assessment of caries diagnosis and caries treatment questionnaire, training in human participant protection, and an in-practice network orientation session with the regional coordinator. Copies of the questionnaires and summary data for dentists' demographic and practice characteristics are also available at http://www.nationaldentalpbrn.org/pdf/DCF_DPBRN_9.pdf ("Longitudinal Study of Repaired or Replaced Dental Restorations").

This study initially used a consecutive patient and restoration recruitment design to gather baseline data. Once the study was started, every patient scheduled to have a repair or replacement of a restoration on a permanent tooth was asked to participate until 50 restorations were enrolled by a single practitioner. Patients who returned for additional appointments while data collection was still ongoing were not eligible for further data collection. To increase the number of patients, a maximum of 4 eligible restorations per patient were enrolled during the first appointment. Restorations discovered after the first appointment were not eligible. A consecutive patient and restoration log form was used to record information on eligible restorations, whether or not the patient participated in the study. All the data collection forms used for this study are available at the National DPBRN Web site (http://www.nationaldentalpbrn.org/pdf/DCF_DPBRN%209.pdf and http://www.nationaldentalpbrn.org/pdf/Study5.Data%20collection%20_2_.pdf).

The restorations that were repaired or replaced were recalled after 12 months and characterized for quality according to defined criteria: acceptable—the restoration

ABBREVIATION KEY. AL/MS: Alabama/Mississippi. DPBRN: Dental Practice-Based Research Network. FL/GA: Florida/Georgia. LGP: Large group practices. MN: Minnesota. NA: Not applicable. PDA: Permanente Dental Associates. PHS: Public health care settings. RBC: Resin-based composite. SK: Denmark, Norway, and Sweden. SP: Solo or small group practices.

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