

# Sealing, refurbishment and repair of Class I and Class II defective restorations

## A three-year clinical trial

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**A**pproximately 50 percent of resin-based composite (RBC) and 60 percent of amalgam (AM) restorations are replaced after seven (RBC) or 10 years (AM) of service.<sup>1</sup> The main reasons for these replacements are secondary (recurrent) caries, marginal defects, discolorations, degradation/wear and loss of anatomical form.<sup>2,3</sup> For many years, replacement of defective RBC and AM restorations has been the most common treatment in general dental practice,<sup>4</sup> and it represents a major part of oral health care in adults with restored dentitions.<sup>1</sup>

When a restoration is replaced, a significant amount of sound tooth structure is removed and the preparation is enlarged.<sup>5-7</sup> Alternative treatments, such as repair or resurfacing, increase the longevity of restorations at a lower cost than that of replacement, and they are the most conservative option.<sup>8,9</sup> Another procedure that has been performed more commonly is sealing of defective margins. This treatment has significantly improved the longevity of restorations.<sup>10,11</sup> Despite the promising results of these treatments, no longitudinal studies have been published, to our knowledge, that assess these alternative treatments to replacement of restorations.

## ABSTRACT

**Background.** The authors conducted a clinical study to examine the effectiveness of treatments other than replacement for defective Class I and Class II resin-based composite (RBC) and amalgam (AM) restorations.

**Methods.** The authors recruited 66 patients (age range, 18-80 years) with 271 Classes I and II defective restorations (RBC = 78 and AM = 193). They assigned restorations to one of the following treatment groups on the basis of the type of defect: sealed margins (n = 48), repair (n = 27), refurbishment (n = 73), replacement (n = 42) or untreated (n = 81). They used modified U.S. Public Health Service/Ryge criteria to determine the quality of the restorations. Two examiners assessed the restorations independently at the beginning of the study and three years after treatment (Cohen's  $\kappa$  = 0.74 at baseline and 0.82 at year 3). They used five parameters in assessing the restorations: marginal adaptation, anatomical form, surface roughness, secondary caries and luster.

**Results.** The authors assessed 237 restorations (RBC = 73, AM = 164) at the three-year recall examination. Restorations that underwent sealing of marginal defects exhibited significant improvements in marginal adaptation ( $P \leq .001$ ). Restorations in the refurbishment group exhibited improvements in anatomical form ( $P \leq .005$ ) and surface roughness ( $P \leq .001$ ). Restorations in the repair group exhibited improvements with regard to anatomical form ( $P = .008$ ). Replaced restorations exhibited improvements in all parameters ( $P < .05$ ), while the untreated group experienced declines in all parameters ( $P < .05$ ).

**Conclusions.** The results of this study show that defective RBC and AM Class I and Class II restorations undergoing sealing of margins, repair or refurbishment exhibited improvements three years after treatment.

**Clinical Implications.** Marginal sealing or repair or refurbishment of anatomical form and roughness are conservative and simple procedures that increase the longevity of RBC and AM restorations with minimal intervention.

**Key Words.** Resin-based composite; amalgam; restorations; longevity; alternative treatment.

*JADA 2009;140(4):425-432.*



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TABLE 1

Modified U.S. Public Health Service/Ryge clinical criteria.*			
CLINICAL CHARACTERISTIC	ALFA†	BRAVO‡	CHARLIE§
<b>Marginal Adaptation</b>	Explorer does not catch or has one-way catch when drawn across the restoration-tooth interface	Explorer falls into crevice when drawn across the restoration-tooth interface	Dentin or base is exposed along the margin
<b>Anatomical Form</b>	General contour of the restorations follows the contour of the tooth	General contour of the restoration does not follow the contour of the tooth	Restoration has an overhang
<b>Surface Roughness</b>	Surface of the restoration does not have any surface defects	Surface of the restoration has minimal surface defects	Surface of the restoration has severe surface defects
<b>Secondary Caries</b>	No clinical diagnosis of caries	NA¶	Clinical diagnosis of caries at restoration margin
<b>Luster</b>	Restoration surface is shiny and has an enamellike, translucent surface	Restoration surface is dull and somewhat opaque	Restoration surface is distinctly dull and is esthetically unpleasing

\* Source: Cvar and Ryge.<sup>12</sup>  
 † Alfa: Restorations in excellent condition, expected to last for a long time.  
 ‡ Bravo: One or more features that deviate from the ideal; restoration may require replacement in the near future.  
 § Charlie: Damage to the tooth or surrounding tissue is likely to occur unless the restoration is replaced or repaired.  
 ¶ NA: Not applicable.

The objective of this prospective clinical trial was to evaluate treatments such as sealing of defective margins or refurbishment or repair of localized clinical defects in restorations that traditionally would be treated by replacement.

Our hypothesis was that sealing of margins or refurbishment or repair of Class I or Class II RBC and AM restorations with certain clinical defects would improve their clinical condition across three years.

**MATERIALS AND METHODS**

We included in this study 66 patients aged 18 to 80 years (mean age, 26.5 years) with 271 Class I or Class II restorations (RBC = 78, AM = 193) that had one or more clinical features that deviated from the ideal. These patients received treatment regularly in the Operative Dentistry Clinic, Faculty of Dentistry, University of Chile, Santiago.

All patients had molar-supported dentition and at least 20 teeth. Restored teeth had to be in functional occlusion with an opposing natural tooth,

and they had to have at least one proximal contact area with a neighboring tooth. All restored teeth were asymptomatic at the baseline examination.

We excluded patients who had contraindications for regular dental treatment according to their medical history, as well as patients with esthetic demands that could not be resolved by the alternative treatments. In addition, we excluded patients who had xerostomia or were receiving treatment with medications that significantly reduced salivary flow. Furthermore, we excluded patients who had psychiatric or physical pathologies that interfered with oral hygiene and patients at an extremely high risk of developing caries.

We obtained written informed consent from all patients, as required by the ethics committee and the research board of the Faculty of Dentistry, University of Chile.

At baseline, two examiners (J.M., E.F.) independently evaluated all restorations clinically by using direct observation only. The parameters examined were marginal adaptation, anatomical form, surface roughness, secondary (recurrent) caries and luster. The examiners classified all restorations as Alfa, Bravo or Charlie, according to modified U.S. Public Health Service/Ryge criteria (Table 1).<sup>12</sup> If the two examiners differed in their evaluation of any parameter, a third examiner was asked to make the final decision. All examiners involved in the study completed calibration exercises.

Two clinicians (G.M., M.C.H.) who did not diagnose the defects completed calibration exercises, assigned teeth to the treatment groups and treated them on the basis of the type of restoration defect present (that is, a total of four operators participated in this study) (interexaminer Cohen’s  $\kappa = 0.76$ ).

Each patient had experimental and control restorations, and, whenever possible, we used a similar tooth type with comparable cavity size. The

**ABBREVIATION KEY.** **A:** Anatomical form. **AM:** Amalgam. **L:** Luster. **MA:** Marginal adaptation. **R:** Surface roughness. **RBC:** Resin-based composite. **SC:** Secondary caries.

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