

An evaluation of replacement rates for posterior resin-based composite and amalgam restorations in U.S. Navy and Marine Corps recruits

John W. Simecek, DDS, MPH; Kim E. Diefenderfer, DMD, MS, MS; Mark E. Cohen, PhD

The U.S. Navy dental care system accepts approximately 70,000 new patients every year into its care and must determine the best course of treatment to achieve and maintain their optimal oral health. Treatment needs among new recruits vary considerably. Similarly, the extent of previous care is quite diverse. Moreover, the type and number of existing restorations in incoming recruits are not readily predictable, and possible differences in replacement rates for restorative materials complicate treatment planning.

RESIN-BASED COMPOSITE AND AMALGAM RESTORATIONS

The availability of resin-based composite materials, which are more esthetically pleasing than dental amalgam, has prompted many private practitioners to use them for posterior restorations. A recent study by Beazoglou and colleagues¹ reported that U.S. dentists placed more resin-based composite than amalgam restorations during 2005. Of the 166 million restorations placed that year, 46.6 percent were resin-based composite, while only 31.6 percent were amalgam.¹ A survey of 714 members of the Academy of General Dentistry revealed that more than 30 percent considered their practices to be “amalgam-free.”²

Longevity. The longevity of pos-

ABSTRACT

Background. Restoration replacement is a clinical concern that has not been studied among military personnel. The authors determined the prevalence of placement of posterior amalgam and resin-based composite restorations and the incidence of replacement among U.S. Navy and Marine Corps personnel.

Methods. The authors analyzed dental records from 2,780 personnel to determine the relative risk of replacement for initially sound restorations during subjects' first years of military service.

Results. At the initial examination, 964 (15.2 percent) of amalgam restorations and 199 (17.4 percent) of resin-based composite restorations required re-treatment. Of those judged clinically acceptable, 14.2 percent of amalgam and 16.7 percent of resin-based composite restorations required replacement during the observation period. The authors found significant increases in replacement rates for resin-based composite restorations compared with amalgam restorations for replacement due to all causes (adjusted hazard ratio, 1.28; $P < .05$), as well as for replacement due to restoration failure (adjusted hazard ratio, 1.64; $P < .01$).

Conclusions. About 30 percent of posterior restorations required replacement, either at the initial examination or during the subjects' first years of military service. In a young military population, significantly more resin-based composite restorations in place at the initial examination will require replacement than will amalgam restorations. Multi-surface restorations had higher rates of replacement than did one-surface restorations, and subjects at high caries risk experienced significantly higher replacement rates than did those at low caries risk.

Clinical Implications. The number of surfaces restored and subjects' caries risk status may influence the longevity of resin-based composite and amalgam restorations.

Key Words. Amalgam; resin-based composite; posterior restorations. *JADA* 2009;140(2):200-209.



Dr. Simecek is a senior scientist, General Dynamics information Technology, Naval Institute for Dental and Biomedical Research, 310 A B St., Great Lakes, Ill. 60088, e-mail "john.simecek@med.navy.mil". Address reprint requests to Dr. Simecek.

Dr. Diefenderfer is division head, Restorative Dentistry, Fisher Healthcare Clinic, Naval Health Clinic, Great Lakes, Ill.

When this study was conducted, Dr. Cohen was a statistician, Naval Institute for Dental and Biomedical Research, Great Lakes, Ill.

terior dental materials has been studied extensively, but only a small number of the evaluations compared dental amalgam with resin-based composite restorations in posterior teeth. We reviewed 12 studies that compared amalgam and resin-based composite restorations in posterior teeth. Even though they did not all show statistical differences, results from nine studies³⁻¹¹ suggested the superiority of amalgam over resin-based composite, while results from three studies¹²⁻¹⁴ suggested that resin-based composite was equal or superior to amalgam. The majority of studies^{3,5,6,10,11,13,14} compared amalgam with resin-based composite restorations in populations in Europe. Only three studies^{4,8,12} compared materials in subjects in the United States.

Randomized studies. Bernardo and colleagues³ found that amalgam performed better than resin-based composite restorations across a seven-year evaluation. They randomly placed 1,748 amalgam and resin-based composite restorations in 472 children aged 8 to 12 years. The survival rate for amalgam (94.4 percent) was significantly greater than that for resin-based composite (85.5 percent). The risk of fracture was similar for both materials, but the risk of secondary caries was significantly higher for resin-based composite than for amalgam (relative risk, 3.5; $P < .001$).

Soncini and colleagues⁴ also observed a greater (although not statistically significant) longevity for amalgam restorations than for resin-based composite restorations. They randomly placed 1,262 resin-based composite and amalgam restorations in permanent posterior teeth of 6- to 10-year-olds. The replacement rate during the five-year follow-up period was 10.8 percent for amalgam and 14.9 percent for resin-based composite, while 14.2 percent of large amalgam restorations and 19.8 percent of large resin-based composite restorations required replacement. The most frequent reasons for replacement were new caries (amalgam, 40 percent; resin-based composite, 33 percent) and recurrent caries (amalgam, 44 percent; resin-based composite, 52 percent).

Norman and colleagues¹² randomly placed 107 resin-based composite and 53 amalgam restorations in 62 patients. After five years, three amalgam (5.7 percent) and six resin-based composite (5.6 percent) restorations failed. They concluded that resin-based composite was as effective as amalgam when occlusal wear, marginal adap-

tation, anatomical form and interproximal contacts were compared.

Mair¹³ studied 90 resin-based composite and 60 amalgam restorations, the majority of which were placed randomly in dental students. After 10 years, 55 resin-based composite and 37 amalgam restorations were available for evaluation. None of the restorations evaluated at the 10-year recall visit required replacement. However, the author reported that four resin-based composite and two amalgam restorations had failed before the 10-year follow-up.

Prospective studies. Van Nieuwenhuysen and colleagues⁵ studied extensive amalgam ($n = 722$) and resin-based composite ($n = 155$) restorations in subjects with a median age of 40 years (range, 16-80 years). All of the restorations evaluated were replacements and placed as alternatives to crowns. More than 60 percent of the teeth had been treated endodontically. At follow-up, when the authors considered repairs, replacements and extractions to be failures, amalgam showed superiority, with a median survival of 12.8 years, compared with a median survival of 7.8 years for resin-based composite. The authors did not recommend resin-based composite restorations as an alternative to crowns.

Mjör and Jokstad⁶ studied the outcomes of 179 Class II restorations (88 amalgam and 91 resin-based composite) placed in adolescents. The estimated survival at five years was significantly greater for amalgam than for resin-based composite. Collins and colleagues⁷ evaluated 213 Class I and II resin-based composite and amalgam restorations placed in 46 patients across an eight-year follow-up period (1986-1994). The rate of failure for resin-based composite restorations was more than twice that for amalgam restorations (amalgam, 5.8 percent; resin-based composite, 13.7 percent). Moffa⁸ reported the results of a large study of resin-based composite ($n = 609$) and amalgam ($n = 1,517$) restorations. The results of that study showed a greater longevity for amalgam, with 65.5 percent of amalgam and 41.7 percent of resin-based

ABBREVIATION KEY. **DO:** Disto-occlusal. **DTFs:** Dental treatment facilities. **MO:** Mesio-occlusal. **MOD:** Mesio-occlusodistal. **NIDBR:** Naval Institute for Dental and Biomedical Research. **ODRM:** Oral Disease Risk Management. **RERs:** Replacement of existing restorations. **SOAP:** Subjective findings, objective findings, assessment, plan.

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