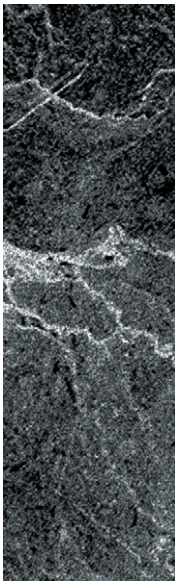

Perspectives

ENDURING AMALGAM: NO REQUIEM NEEDED

Over the past three decades, the editorial pages of several scientific journals have prematurely predicted the demise of silver amalgam as a restorative material. In 1984, it was written, "Amalgams days are certainly limited".[1] An editorial titled "The death of amalgam" was published in 1991, and it again concluded that amalgam's days were numbered and concluded with "The coffin is open, and waiting".[2] An editorial published in 1995 proclaimed that amalgam should never be used as a first-time restorative material and that it should not be used in pediatric dentistry, because better materials are available.[3] The author concluded it was time for amalgam "to move over—at last". A more recent analysis, published in 2008, concluded that while amalgam will eventually join materials like gold foil and silicate cement in the restorative hall of fame, it is still a useful material, and its demise will be gradual and graceful and will occur at a measured pace.[4] In spite of these assaults on silver amalgam for more than 26 years, we believe that in 2010 this material continues to be a safe and useful material choice that helps dentists meet the restorative needs of their patients. We also believe that amalgam should continue to be taught in dental schools and that graduating students must possess the knowledge and skills essential to place excellent amalgam restorations.

The concerns echoed in these editorials, in part, related to the issue of the safety of silver amalgam. Although it is beyond the scope of this editorial to discuss the mountain of evidence related to this issue, interested readers should review the results of two excellent randomized clinical trials published in the *Journal of the American Medical Association* in 2006, comparing the safety and efficacy of silver amalgam and resin composite restorative materials.[5,6] Both studies, with over 500 subjects, concluded that amalgam is both efficacious and safe as a restorative material. Both the American Dental Association (ADA) and the Food and Drug Administration (FDA) have recently again affirmed their belief that amalgam is a safe and durable restorative material, and its use should not be restricted in any specific groups of patients. To conclude that dental amalgam should be discontinued because of safety issues is disingenuous and displays a lack of knowledge of the scientific literature on the topic. Yet there are still dentists today who use misinformation and outright lies about dental amalgam to promote their own self-interests.

The fact is that if someone indeed wanted to vilify a material and take bits of information and misrepresent it to promote a viewpoint, more concern could be directed at the safety of resin composites than at dental amalgam! News reports in recent years have generated widespread concerns regarding the potential estrogenicity of resin composites. More recently, resin composites have been implicated with other Bisphenol A (BPA) containing consumer plastic products to be potentially carcinogenic. As is the case with dental amalgam, these concerns have been largely exaggerated and inaccurate. Yet is it not ironic that the very material being touted as the alternative to silver amalgam is itself also now being subjected to the very hysteria and misinformation that

DOI 10.1111/j.1708-8240.2010.00352.x

for years has plagued silver dental amalgam?

It must be noted that as is the case with dental amalgam, dental resin composites are indeed safe. The ADA's own website (see http://www.ada.org) does an excellent job of addressing the safety of resin composites. For example, they note that the estimated one-time exposure (upon sealant placement) for a male child of average body weight (23–51 kg)[7] is approximately 5.5 μg,[8] which is two to five times lower than the estimated daily exposure from food and environmental surfaces.[9] The FDA also confirms this observation of safety with regard to BPA.[10]

The other concerns about amalgam are real. It is certainly not an esthetic restorative material, which goes against the flow in today's world of esthetic lunacy. More importantly, it is not as conservative of tooth structure as are adhesively retained tooth colored materials, and often sound tooth structure must be removed to accommodate the properties of silver amalgam. This fact lead Simonsen to correctly proclaim that the initial restoration of a tooth (assuming caries was detected early) should be made with an adhesively retained, directly placed, tooth colored material, because the cavity preparation can be considerably more conservative.[3] We enthusiastically support this position, but recognize that this advantage of conservation of tooth structure does not exist with teeth that were previously restored or teeth with large carious lesions.

Another real issue with amalgam is safety of the environment. Studies have shown that in its reacted form, little mercury is released into water sources, and the increased use of separators in the dental office and at water treatment plants insures that there is a minimal environmental impact that can be traced to the use of amalgam in dentistry. Mercury is ubiquitous in the environment and most of this contamination can be traced to the mining and handling of coal.

The use of silver amalgam has declined in the past three decades. Part of this decline is a result of the well-documented decline in caries rates in developed countries, and part is a result of the desire for a more esthetic material. The ultra-conservative nature of adhesively retained resin composite materials has properly led to the increased use of these materials in posterior teeth. Imagined fears related to the safety of amalgam have undoubtedly contributed to the decline in the use of amalgam. However, the fact remains that there are specific lesions in specific patients for which silver amalgam is the best option available.

While amalgam has some disadvantages, it also possesses some important advantages. Because of the buildup of corrosion products over time at the interface between the amalgam and the walls of the tooth cavity preparation, amalgam effectively self-seals itself to the cavity. It is very strong and durable, and is easy to place. Leinfelder correctly commented a few years ago that every graduating dental student in every school in the country can properly place a serviceable amalgam, while fewer than 50% can properly place resin composite materials.[11] We believe that the latter situation has changed in a positive way with resin composite materials, but there is no question that silver amalgam is the most user-friendly restorative material in dentistry. It is also the most cost-effective restorative material.

One of the most important indications for the use of amalgam is the replacement of old, existing amalgam restorations. When existing amalgam restorations require replacement, resin composite materials offer no advantages other than improved esthetics. Tooth reinforcement with adhesive restorative materials has been demonstrated in the short term, but is very likely ineffective in the long term.

Another indication for use of silver amalgam is in the restoration of large Classes I and V carious

lesions. Resin composite materials perform very well in small to mid-sized lesions, but their effectiveness is reduced in large lesions, especially in molars. Data gleaned from the New England randomized clinical trial indicated that resin composite materials required repair or replacement seven times greater than did amalgam restorations, and the larger the restoration, the greater the likelihood repair or replacement would be necessary.[12] It is important to understand that resin composite materials, while vastly improved over the past three decades, are not suitable as a universal replacement for silver amalgam. One specific situation where resin composite materials are contraindicated, for example, is when the gingival margin of a Class 2 preparation must be extended beyond the cervical enamel and is necessarily prepared in dentin. In this situation, it is highly unlikely an adequate seal will be attained with current resin composite materials and adhesives.

Other important indications for silver amalgam are for large, multisurface "holding" restorations and as cores or foundations, particularly with endodontically treated posterior teeth. The utility of silver amalgam in large, multisurface cavities was beautifully and unforgettably illustrated in Harold Shavell's classic article published in this *Journal* again in 2005.[13] It can also be argued that amalgam is a better material than resin composite in patients at very high risk for caries.

It is clear that many well-informed experts have been prematurely predicting the death of silver amalgam for many, many years. It is also clear that resin composite materials and dental adhesives have made great strides over this same time, and they offer patients alternative choices and advantages in restoring many carious lesions. However, it is our belief that intelligent, well-informed restorative dentists should offer their patients a menu of restorative services. It is the responsibility of these dentists to educate their patients so they make intelligent choices from that menu, and also that they (the dentists) attain the knowledge and skill to properly provide those restorative services. Editorial obituaries notwithstanding, in 2010, we believe that silver amalgam should continue to be placed on that menu.

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