



Articles and Position Statements

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Amalgam Safety

Position Statement

Introduction

Amalgam has been utilized as a restorative material in dentistry for more than 150 years (source: Statement by the ADA to the Government Reform Committee, US House of Representatives on "Mercury in Dental Amalgams: An Examination of the Science"; November 14, 2002). More recently the safety of dental amalgam has been challenged due to the fact that dental amalgam contains mercury. Free mercury, like other heavy metals, has been shown to be toxic. However, the mercury in dental amalgam is not free mercury and therefore does not share the same toxic characteristics.

Nevertheless, the slightest suggestion that dental amalgam has the potential to be toxic and may contribute to the cause of such feared diseases as Alzheimer's, multiple sclerosis and autism—all of which have unknown or little understood etiology and/or no available cures—creates a public fear and understandable concern about the safety of dental amalgam.

Given that other materials such as gold, resin-based composites and glass ionomers can be substituted for amalgam as restorative materials, there has been an effort to simply ban amalgam in the United States. Those in support of such a ban have often advanced inaccurate information regarding the ban of amalgam in other countries.

The use of amalgam as a restorative material has declined while the use of alternative materials, primarily resin-based composite, has increased in recent years. While some of the shift to composite can be attributed to an increased desire for cosmetics, clearly the fear of toxicity has also contributed to the decline in the use of amalgam. A recent study published in the Journal of Materials Science: Materials in Medicine discovered that an increase in BPA (bisphenol-A) concentration was found in saliva after restoration with resin-based composite. BPA is a compound that exhibits exogenous endocrine disrupter action. Researchers recommended gargling after these restorations to remove the excess BPA from saliva. While this study alone does not disqualify resin-based composite as an acceptable restorative material, it does suggest that there may be potential safety issues related to the chemicals used in these alternative materials. There is little doubt that these materials have yet to receive the same level of scrutiny as amalgam.

Another effect associated with the fear of mercury toxicity, inappropriately attributed to dental amalgam, is the removal of adequate and serviceable existing amalgam restorations.

Summary of Evidence

One could anoint amalgam as safe empirically from its long history of use without any documented ill-effects except for a very small number of allergic reactions to one or more of the components in amalgam. Nevertheless, because mercury has been shown to be toxic and one of dental amalgam's major components is mercury, the concern for safety is a legitimate issue. As such, there have been a number of significant studies to determine if amalgam is safe and the evidence supporting the safety of dental amalgam is extensive. Numerous international studies could be cited in support of amalgam safety. For example, Mark Berthold reported the following in the ADA News published March 16, 2005:

A new study, conducted by leading scientists from highly regarded research and academic institutions, finds no link between amalgam exposure and neurological function.

The article highlights the following key outcome:

"Our findings do not support the hypothesis that exposure to amalgam produces adverse, clinically evident neurological effects," concludes a research team led by Albert Kingman, Ph.D., Chief, Biostatistics Core, at the National Institute of Dental and Craniofacial Research, part of the federal National Institutes of Health.

"The bottom line," says co-researcher James W. Albers, M.D., Ph.D., of the University of Michigan Medical School, "is there was no association between abnormal neurological signs and amalgam exposure. So these findings do not support the hypothesis that amalgam exposure produces clinically evident neurological effects."

The article further states:

Dr. Daniel M. Meyer, associate executive director, ADA Division of Science, notes, "Amalgam is a safe dental restorative material. This study, like the recently published report by the independent, nonprofit Life Science Research Office, which extensively reviewed the literature and concluded that amalgam is safe to use in people, adds to the definitive scientific evidence attesting to amalgam's demonstrated track record of safety."

The effect of amalgam restorations on children has been of particular interest. Dental amalgam contains mercury, which may have neurotoxic effects on the nervous systems of developing children and fetuses. When amalgam fillings are placed or removed from the teeth, they release mercury vapor. Mercury vapor is also released during chewing. It has been suggested that this release of mercury vapor could be significant enough to cause neurologic effects in children and fetuses.

For the purpose of this position paper, we will cite the ADA News article written by Jennifer Garvin and published in the April 2006 issue that discusses two important studies from the Journal of the American Medical Association related to amalgam safety:

Two studies in the April 19 issue of the Journal of the American Medical Association conclude that children with dental amalgam fillings do not experience adverse effects related to neurobehavioral, neuropsychological (IQ) and kidney function, reinforcing the ADA's longstanding position on the safety of dental amalgam.

The ADA reports that both independent studies "reinforce the substantial body of peer-reviewed scientific literature that supports the safety of dental amalgam."

"Neurobehavioral Effects of Dental Amalgam in Children" and "Neuropsychological and Renal Effects of Dental Amalgam in Children" are the first randomized controlled trials comparing the health effects in children treated with amalgam fillings with those treated with composite resins. The former was conducted in Lisbon, Portugal, and involved 508 children, ages 8 to 10, who were randomly assigned amalgam or composite fillings. The latter took place in Boston, Massachusetts and Farmingham, Maine and comprised 534 children, ages 6 to 10, who also were randomly picked to receive amalgam or composites. Both studies were funded by the National Institute of Dental and Craniofacial Research and were made up of children who had no previous restorations.

The ADA News article continued:

In a press release sent to media outlets across the United States, the ADA says, "These studies support existing scientific understanding that the minute amount of mercury released by amalgams during eating and drinking does not affect health adversely." The Association goes on to reinforce that "both studies support the continued use of dental amalgam as a treatment option."

Every recognized bona fide health organization including the Centers for Disease Control (CDC), World Health Organization (WHO), Food and Drug Administration (FDA), US Public Health Service (USPHS), National Institutes of Health (NIH), American Medical Association (AMA), and the American Dental Association (ADA) have deemed amalgam to be safe:

In answer to the question: "Should pregnant women and young children use or avoid amalgam fillings?" the FDA provides a cautionary directive as follows:

"The recent advisory panel believed that there was not enough information to answer this question. Some other countries follow a 'precautionary principle' and avoid the use of dental amalgam in pregnant women."

Pregnant women and persons who may have a health condition that makes them more sensitive to mercury exposure, including individuals with existing high levels of mercury bioburden, should not avoid seeking dental care, but should discuss options with their health practitioner.

Anti-amalgam groups have suggested that the fact that some countries have instituted a "ban" on dental amalgam suggests that amalgam is not safe. The U.S. Centers for Disease Control (CDC) reported the following in their "Fact Sheet on Dental Amalgam" in December of 2001:

Sweden, Denmark, and Germany have proposed restrictions on dental amalgam use to diminish both human exposure to and environmental release of mercury and not because of any documented health effects associated with exposure to dental amalgam.

Alternatives to amalgam include gold, resin-based composites, or glass ionomers. Resin-based composites and glass ionomers are used more extensively than gold since gold is significantly more expensive. There are scientific studies that demonstrate that amalgam restorations placed on stress bearing posterior teeth have greater longevity than composite restorations. For example, references to support this finding include those from Allan DN, "A longitudinal study of dental restorations" published in the British Dental Journal in 1977 and Burke FJ, Sheung SW, Major IA, Wilson NH, "Restoration longevity and analysis of reasons for the placement and replacement of restorations provided by vocational dental practitioners and their trainers in the United Kingdom" published in Quintessence International in 1999. Karl F. Leinfelder, DDS, MS also published the following in his article "Do Restorations Made of Amalgam Outlast Those Made of Resin-Based Composite?" in JADA in August 2000:

The dental literature reports that the longevity of amalgam is greater than that of resin-based composites. The length of survival varies from study to study. On average, however, most amalgam restorations can be expected to serve clinically for 10 to 12 years. Resin-based composites, on the other hand, perform adequately for about half that time.

It should be noted that Dr. Leinfelder also goes on to state: "However, because of the many recent improvements in resin-based composites and a better understanding of how to place them, their length of survival has increased substantially."

While it can be argued that the longevity of modern dental resins is comparable to dental amalgam, there is no evidence to date to demonstrate that they are superior. There is a consensus among dental practitioners that the placement of resin-based composite restorations is more technique sensitive often requiring a dry field. Establishing good interproximal contacts and proper occlusion, as well as the carving of occlusal anatomy, is more difficult with composite material. There is also a consensus that composite restorations demand a higher fee than amalgam restorations primarily due to the increased operative time for placement and the higher cost of materials. However, as stated earlier, it is also important to note that the potential safety issue related to the chemicals used in these materials, particularly resin-based composites, has been expressed recently and is an issue that has yet to receive the same level of scrutiny as amalgam.

According to a study published in the September-October 2007 issue of Public Health Reports, the economic impact of banning amalgam restorations would be significant:

If amalgam restorations are banned for the entire population, the average price of restorations before 2005 and after

the ban would increase \$52 from \$278 to \$330, and total expenditures for restorations would increase from \$46.2 billion to \$49.7 billion. As the price of restorations increases, there would be 15,444,021 fewer restorations inserted per year. The estimated first-year impact of banning dental amalgams in the entire population is an increase in expenditures of \$8.2 billion.

Conclusions: An amalgam ban would have a substantial short- and long-term impact on increasing expenditures for dental care, decreasing utilization, and increasing untreated disease. Based on the available evidence, we believe that state legislatures should seriously consider these effects when contemplating possible restrictions on the use of amalgam restorations.

One final important distinction between amalgam and resin-based composite is the antibacterial properties of each material. A study conducted by Dag Orstavik at the Scandinavian Institute of Dental Materials, NIOM, Oslo, Norway tested nine commercial dental amalgams for antibacterial properties in vitro. He concluded:

All amalgams displayed some antibacterial properties.

More recently, N. Beyth, A. Domb, and E. Weiss published a study in the Journal of Dentistry in 2007 concluding the following:

The present findings demonstrate potent and lasting antibacterial properties of amalgam, which are lacking in composite resins. This may explain the clinical observation of biofilm accumulated more on composites compared to amalgams. It follows that the assessment of antibacterial properties of poorly-soluble materials has to employ more than one assay.

Another recent study confirmed the anti-bacterial properties of amalgam alloy. This study from the University of Heidelberg was presented in a poster session at the 2006 Interscience Conference on Antimicrobial Agents and Chemotherapy and received online news coverage from MedPage Today (see Phend C., ICAAC: "Amalgam Dental Fillings Fend Off Bacteria Better than Composite"; MedPage Today, Sept. 29, 2006; available at www.medpagetoday.com/2005MeetingCoverage/2005ICAACMeeting/tb/4200).

The study concluded that titanium, gold, natural enamel and amalgam alloy were superior to resin-based composite materials in reducing the adherence of Streptococcus mutans to dental restorations.

Position Statement

Based on current best evidence, it is the recommendation of the Committee that the AADC take the following position on the use of dental amalgam and amalgam safety.

1. There does not exist at this time evidence based scientific research to support the assertion that the mercury contained in dental amalgam causes disease or neurological disorders in children. To the contrary, recent peer reviewed research has demonstrated that there is no cause-effect relationship between dental amalgam and neurological status in children. Further, there is no valid research to support the allegation that significant amounts of toxic mercury is leached from dental amalgam causing diseases such as Alzheimer's, multiple sclerosis or autism. Therefore, the Committee supports the conclusion that dental amalgam is safe as a restorative material.
2. There is credible evidence to support the conclusion that the longevity of dental amalgam restorations exceeds those of resin-based composite. However, there is also literature to support that the newer generations of composite are reducing the longevity difference between amalgam and composite. As such, the Committee supports the conclusion that dental amalgam currently is more durable and cost effective than resin-based composite as a restorative material for stress bearing posterior teeth.
3. Current literature citing the ban of dental amalgam in other countries, primarily Sweden, Denmark, and Norway, is confusing in both the nature and reasons for the ban. Bans in other countries per se do not constitute evidence based scientific research that dental amalgam is not safe. In fact, most literature and articles referencing legislative bans indicate that any bans or restrictions are related to environmental factors associated with mercury toxicity rather than any concern about dental amalgam safety. There is good literature and data to support the conclusion that a ban of dental amalgam in the United States would significantly increase the cost of dental care and likely reduce access to care, particularly among that portion of our population that is financially disadvantaged. It is this demographic that is most in need of dental care. On this basis, the Committee does not support any efforts to legislate a ban of dental amalgam in the United States.
4. The "precautionary principle" has been advocated for the placement of dental amalgam in children and pregnant women. The choice of material for the restoration of teeth should be made by the patient in consultation with their dentist. The Committee is not endorsing nor recommending the use of any particular restorative material. The Committee, through this position paper, is merely supporting the conclusion that dental amalgam is a safe, durable, and affordable dental restorative material.

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