Safe Removal of Amalgam Fillings

Dentists all over the world remove millions of amalgam fillings every day, with no regard for the possible mercury exposure that can result from grinding them out. Much of the time, a new amalgam filling goes back in place of the old one. The dental establishment claims that amalgam is a stable material, that emits little or no mercury, but then turns around and blames the mercury–free dentists for "unnecessarily exposing patients to excess mercury" when removing amalgams electively. Well, which is it? Stable, or mercury emitting?

We know beyond any doubt that amalgam emits mercury, as elaborated in the related article, "The Scientific Case Against Amalgam." Finished amalgam on the bench at 37^0C will emit as much as 43.5µg of mercury vapor per square centimeter of surface area per day, for extended periods of time.[1] Cutting the amalgam with a dental bur produces very small particles with vastly increased surface area, and vastly increased potential for subjecting the people present to a mercury exposure. In fact, in a recently published experiment, volunteers with no amalgam fillings swallowed capsules of milled amalgam particles, and, sure enough, their blood mercury levels increased.[2] These authors concluded that "the GI uptake of mercury from amalgam particles is of quantitative importance." Molin, et. al. demonstrated a three to four fold increase in plasma mercury the next day, and a 50% rise in urine mercury for a month following amalgam removal in ten subjects, after which their mercury levels began to decline.[3] Snapp, et. al.[4] showed that efforts to reduce mercury exposure during amalgam removal resulted in less uptake of mercury than that cited in the Molin study.

Less well studied than mercury vapor is the problem of amalgam particulates. Taking out fillings with a high speed dental bur generates a cloud of particles, at least 65% of which are one micron or less in size. These are fully respirable, get deep into the lungs, where the microscopic particles are broken down and the mercury is systemically absorbed within a few days. This mercury exposure can be as much as a hundred times greater than that from the vapor.[5] [6]

Stories abound concerning patients having adverse reactions – getting sick – following removal of amalgam fillings, whatever they are replaced with, although there is no established scientific literature on the subject. The mercury free dentists of the world have been acutely aware of the excess exposure problem, and have devised a number of strategies for reducing the amount of mercury exposure to both patients and dental staff during amalgam removal. This article will cover the physical methods, the barrier and ventilation techniques, while a related article will deal with "biological support," nutritional methods to support the anti-oxidant and excretory systems that are stressed by heavy metal exposure. The techniques in this chapter have been checked with the aid of the Jerome mercury vapor detector by IAOMT members, and found to reduce mercury vapor in the air that the patients and dental staff breathe. Even though it has not been tested experimentally and published in peer reviewed journals, experience indicates that when the dentist fastidiously reduces mercury exposure while removing amalgams, the patients report fewer episodes of feeling sick afterwards.

However, please bear in mind that the material presented here is intended strictly as a set of suggestions. A licensed practitioner must make up his or her own mind concerning specific treatment options.

Cut and chunk, keep it cool

Most of these suggestions are simple and obvious, common sense physical means of reducing exposure. If you remove an old amalgam by slicing across it and dislodging big chunks, you will aerosolize less of the contents than if you grind it all away. If you keep it under a constant water spray while cutting, you will keep the temperature down, and reduce the vapor pressure within the mercury.

Suction!

Your best tool for removing mercury vapor and amalgam particulates from the operating field is your high volume evacuation (HVE). Keep it going next to the patient's tooth until you are finished with the removal and clean-up process. But check to see where in your office it discharges! If the vacuum pump discharges into an open trap or through its own base, you could be pumping mercury vapor into your utility room or lab.[7] (See also the Environmental articles on this website for information concerning mercury separators for your suction system, to remove the amalgam particulates and dissolved mercury before they are discharged into the wastewater.)

A highly effective HVE adjunct is the "Clean-Up" suction tip, which has an enclosure at the end that surrounds the tooth you're working on. It dramatically reduces the spatter of particles, directing them efficiently into the suction tube. "Clean-Up" is available from Bioprobe, Inc. (601-261-9797). (*Disclosure: Bioprobe, Inc. is owned by an IAOMT member and his family.*)

Rubber dam or no rubber dam?

Some dentists hate rubber dams, while others can't live without them. Reduced exposure amalgam removal can be done either way. A rubber dam will help contain the majority of the debris of amalgam grinding, among its many other benefits. Berglund and Molin[8] demonstrated, as a follow-up to Molin's 1990 study, that the use of a rubber dam eliminated the spike in plasma mercury one day after amalgam removal, as well as the spike in urine mercury ten days afterward: evidence of its protective benefit. Of course both amalgam removal groups, dam or no dam, showed 50-75% reduction in mercury levels a year later.

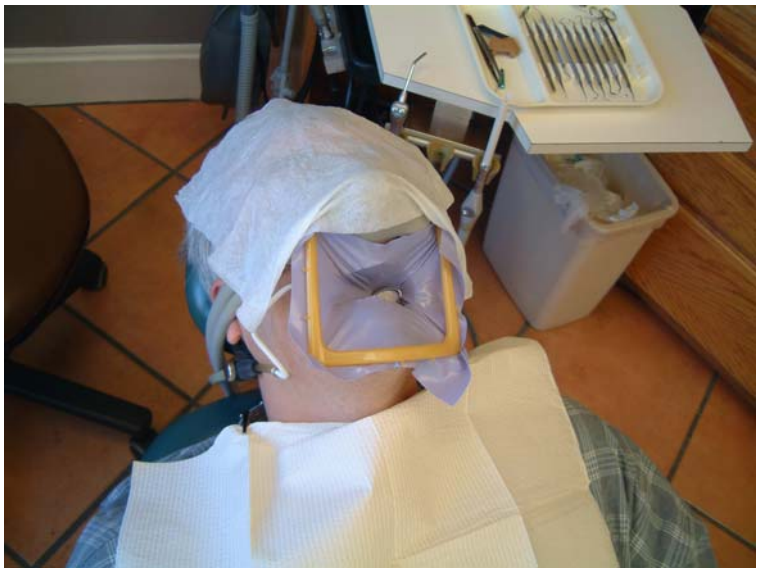
But you must know that mercury vapor will diffuse right through the dam, and some of the particulates will often sneak past it. So:

- Always use a saliva ejector behind the dam to evacuate air that may contain mercury vapor.
- Rinse the dam well as you go, because amalgam particles left on it will emit mercury from your garbage can. (If you wipe your dirty mirror on a gauze square or the patient's bib, that gray smear also emits quite a lot of mercury vapor!)
- As soon as the amalgams are out, remove the dam and thoroughly rinse the patient's mouth before placing the new restorations. It can take as much as sixty seconds of rinsing to fully remove the mercury vapor. Search for gray particles. If there are particles on the back of the tongue, have the patient sit up and gargle them out.

If you don't use a rubber dam, you must be vigilant with the HVE, and take frequent breaks to thoroughly rinse the field. Either way, the "Clean-Up" suction tip reduces the dispersion of particulates in the area.

Cover the skin

Covering the patient's face with a barrier will prevent spattered amalgam particles from landing on the skin, or the eyes. The barrier can be as simple as a moist paper towel, or as elaborate as a surgical drape.



Basic patient barriers

Rubber gloves

Mercury vapor will diffuse through latex and vinyl gloves, just as it does through latex and vinyl rubber dams. Nitrile material is a more effective diffusion barrier, and while there are no nitrile rubber dams available, nitrile rubber gloves appear to better protect the dentist's hands from a concentration of mercury vapor.

Controlling the breathing space

However efficient your HVE technique is, the air surrounding the operative field will fill up with a mercury vapor and amalgam particulate aerosol. Keeping the breathing space of the patient and dental staff free of contamination is the next priority.

Supplemental air

Provide the patient with piped–in air, so they do not have to breathe the air directly over the mouth during amalgam removal. A positive pressure respiration device such as a nitrous oxide nose hood, or a similar ventilation device, is probably the best way to provide clean air. A nasal cannula that admits ambient air won't help.

Respirators for the staff

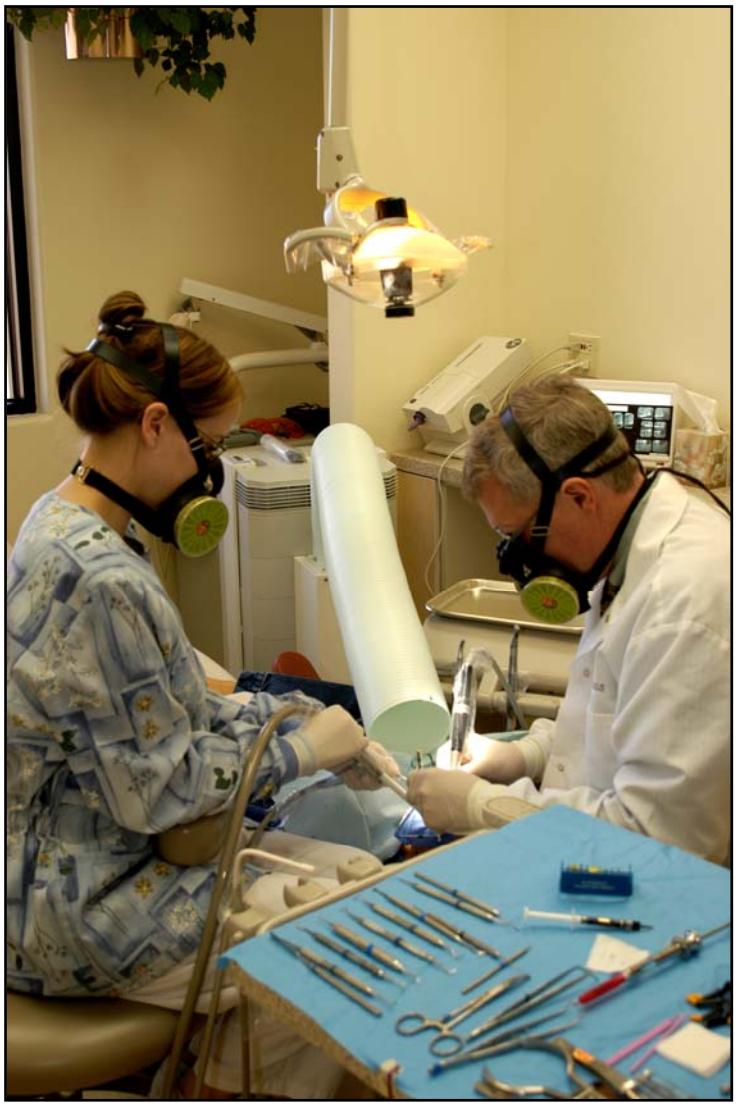
The typical paper hygienic masks that are in everyday use are of no benefit whatsoever for removing either amalgam particulates or mercury vapor from the air we breathe. The best protection for the dental staff, from an industrial hygiene point of view, would be a positive pressure respirator. This kind of system is certainly available from safety equipment suppliers. Much simpler to set up would be a Bureau of Mines certified, "half–mask" respirator with mercury rated filter cartridges. However, the cartridges need to be fitted with a "P-100" rated particulate filter, which will remove particles as small as 0.3 microns.

The IAOMT Store (http://www.iaomt.org//store.cfm) sells the MSA "Comfo-Classic" respirator for this purpose. The 3M company makes a similar half-mask respirator with mercury rated cartridge (#6009) and accompanying P-100 pre-filter, that is available from many industrial sources.

Maintain clean air in the operatory

Mercury vapor and amalgam particulates generated by removing amalgams disperse in the air of the operatory, leading to a background exposure throughout the office. Beyond opening the window, here are some strategies for mitigating the problem:

Filtration: A charcoal filter on your room air cleaner will help a bit. More effective systems add negative ion generators to enhance the removal of metallic vapors and sub-micron



Taking mercury vapor seriously while removing amalgam.

floating particles. The "Tact-Air" is a stand alone filtration unit that combines a negative ion filter with a fan for enhanced removal of contaminated air from the operative space (905-842-2573). American Environmental Systems (303-449-3670) makes a negative ion system for industrial clean–rooms that can be unobtrusively installed, and left on all the time. Other sources and suppliers can be found on the Web.

Supplemental evacuation: Simply moving air away from the operative field can be effective in reducing mercury exposure, and some offices have installed creatively designed mechanisms. One IAOMT member had the central vacuum cleaner in his office vented to the exterior of the building. The patients hold the vacuum hose under their chins as he removes their amalgam fillings, resulting in zero mercury vapor detectable in the room.

[1] Chew, CL; Soh, G; Lee, AS; Yeoh, TS. Long-term dissolution of mercury from a non-mercury-releasing amalgam. Clin Prev Dent. 13(3): 5-7. (1991)
[2] Geijersstam, E; Sandborgh-Englund, G;Jonsson, F; Ekstrand, J. Mercury uptake and kinetics after ingestion of dental amalgam. J Dent Res. 80: 1793-1796 (2001)
[3] Molin, M; Bergman, B; Marklund, SL; Schutz, A; Skervfing, S. Mercury, selenium, and glutathione peroxidease before and after amalgam removal in man. Acta Odontol Scand 48(3): 189-202 (1990)
[4] Snapp, KR; et al. The Contribution of Dental Amalgam to Mercury in Blood. J Dent Res, 68(5):780-5, 1989.

[5] Richardson, GM; Inhalation of mercury-contaminated particulate matter by dentists: an overlooked occupational risk. Hum Ecol Risk Assess 9:1519-1531 (2003)
[6] An extensive discussion of this issue is presented in Richardson's lecture to the IAOMT in October, 2004. A DVD copy of the lecture can be obtained through the Store at www.IAOMT.org//documents/Nashville%20AV.pdf.
[7] Stonehouse, CA; Newman, AP. Mercury vapour release from a dental aspirator. Brit Dental J. 190:558-560 (2001)
[8] Berglund, A; Molin, M. Mercury levels in plasma and urine after removal of all amalgam restorations: the effect of using rubber dams. Dent Mater 13:297-304 (1997)