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Safe Removal of Amalgam Fillings in Dental Clinic: Use of Synergic Nasal Filters (Active Carbon) and Phytonaturals

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Abstract: ***Dental amalgam restorations were introduced to North America in the 1830s. Thus, dentist and patient should have been encouraged to avoid risk factors associated with unnecessary exposure to mercury during/after removal amalgam fillings. Mercury exposure from amalgam fillings is dramatically increased by chewing, eating, brushing, and drinking hot liquids. To avoid this, the use of safe protocols for dental filling removal together with (the synergic) use of nasal filters (active carbon) and nutritional supplements (i.e.: Curcuma longa, Clorella, Desmodium….) would enhance endogenous detoxification capacities against heavy metals in patients before / during / after removal of dental amalgam. Other factors, as the presence of implants, electromagnetic fields and orthodontic treatments can contribute to mercury and other heavy metal release. Finally, the safe procedures or alternatives even if certainly some cause-effect relationships have yet to be properly established.***

Keywords: mercury, dental amalgam, curcumine, safe removal of dental fillings, safe protocol, odontology, dentists, toxicology, heavy metals, Nasal Filters

1. Introduction

With the growing use of chemicals (pesticides, environmental contaminants), the risk of sensitivities, allergies, and other illnesses have risen [1,2]. Dental amalgam restorations, also called silver mercury fillings, were introduced to North America in the 1830s. At that time, there was a controversy about its intraoral use as a restorative filling. However, mercury offered a substantial cost reduction since it forms amalgams with other metals (silver, copper, tin, and zinc) [2] and has been used in medicine and dentistry for centuries. Dental professionals ought to be aware of impact of mercury on human health. In 2011, Mutter described the problems of dental amalgam in humans [3,4]. In the mid of 19th century, there was controversy about its intraoral use as a restorative filling. The level of prolonged exposure to mercury vapor from dental amalgam fillings, combining with other metals, represents a real risk to patient's health [5,6]. Mercury can have damaging effects on the kidney, central nervous system [7] and cardiovascular system, and has been absorbed from gingival tattoos. Mercury exposure from amalgam fillings is dramatically increased by chewing, eating, brushing, and drinking hot liquids [8]. Thus, dentist and patients should been encourage to avoid risk factors associated with unnecessary exposure to mercury after removal amalgam fillings [5, 9]. Over ten years ago, the Federation of American Societies for Experimental Biology Journal (FASED Journal) reported that dental amalgam restoration is a major source of mercury exposure to the USA population [10,8]. An alternative is the use of white composite. Dental amalgams is a stable material, that emits little or no vapor when dental fillings are removed as indicated in "*The Scientific Case Against Mercury Amalgam*" and "*Understanding Risk Assessment for Mercury From Dental Amalgam*" [2]. People who chew gum create a smooth, shiny surface on their fillings which could increase mercury vapor levels released by chewing grains, nuts, seeds, and gum, as has been detected using mercury vapor analyzers [11,8]. However, the finished amalgam on the bench at 37 ^{o}C will emit as much as 43.5 µg of mercury vapor per square centimeter of surface area per day. In comparison, samples of the leading brands of amalgam kept in water at 23 ^{o}C released 4.5 to 21 µg per square centimeter per day [12,13].

Moreover, cutting the amalgam can increase mercury patient's exposure to patients. In a recent experiment volunteers without amalgam fillings swallowed capsules of milled amalgam particles and then had high blood mercury levels, suggesting that the uptake of mercury from amalgam particles is of quantitative importance. According to this evidence, we must develop safe protocols for dental amalgam removal in patients. Other factors like pressure exerted by teeth, type of daily diet consumed presence of other metals and the size of the restoration in the mouth will influence the choice of materials. Firstly, a physician should evaluate the overall health of the body and the proper detoxification capacities because there is polymorphism that affects susceptibility to mercury toxicity [3].

2. Synergic protocols for safe removal of dental fillings: an integrative view in a dental clinic

The following steps are followed when removing silver mercury filling to ensure minimal sublingual, or mucosal tissue absorption. These protocols would also avoid mercury

vapor absorption through the blood/brain barrier after amalgam removal [10,14]. Molin et al., reported three to four fold increases in plasma mercury the next day after amalgam removal, and a 50% rise in urine mercury for a month in ten subjects, after which their mercury levels began to decline [15]. Thus, efforts to reduce mercury exposure during amalgam removal are necessary [2]. The removal of fillings can generate a cloud of particles, at least 65% of which are one micron or less in size, and are fully breathable, penetrate deep within the lungs, and increase mercury levels that are systemically absorbed within a few days. The use of nasal filters by patient and dentist (active carbon) would minimize mercury vapor absorption and strongly reduce mercury penetration in lungs and brain [16,17]. A randomized, double-blind study demonstrated that nasal filters protect against diseases and foreign air born particles entering the nasal pathways [18,19]. The use of wide-spectrum nose filters also offers protection from particulate and gaseous pollutants, including against mercury vapor in a dental clinic. Interestingly, Torkmahalleh MA et al., reported that preventing the ambient aerosol collected on the filters from deliquescing is a key to improving the sampling of Cr (VI), which with exposure to toxic levels can lead to cancer, nasal damage, asthma, bronchitis, pneumonitis [20]. In addition, dietary supplements (*Chlorella* or *Curcuma longa)* before/during/after dental amalgam removal would enhance the endogenous detoxification against heavy metals in patients [21,22]. For instance, vitamin C intake is recommended, often with other supplements as such selenium, or *Desmodium*, prior to and following amalgam removal since this would enhance endogenous detoxification capacities in patients. These mechanisms must be monitored by laboratory analysis to confirm the possible chronic mercury contamination. The synergic use of carbon-nasal filters would quelate vapor mercury and may ameliorate the risk of allergies after dental amalgams removal in patients [1]. Thus, synergic strategies for preventing mercury toxicity would ensure a minimal absorption while dental fillings were being removed (Figure 1).

We must also contemplate safety protocols for dentists based on the use of nitrile rubber that protects the dentist's hands from a mercury vapor concentration [2]. Keeping the breathing space of the patient and dental staff free of contamination must also be a priority. The best protection for the dental staff would be a positive pressure breathing system, which is commercially available from safety equipment suppliers (i.*e: Bureau of Mines certified, "half–mask" respirator)*, with mercury rated filter cartridges. In fact, the 3M company makes a similar half-mask respirator with mercury rated cartridge (#6009) and accompanying P-100 pre-filter, which will remove particles as small as 0.3 microns, and is available from many industrial sources (Figure 2). Prior to amalgam removal, preparation of the patient before the procedure and after treatment could help avoid mercury absorption. Thus, the patient is draped with a plastic apron under the dental bib to cover their clothing; a dental dam ("raincoat") is customized to fit the existing tooth/teeth to prevent particulates reaching the oral mucosa [2] (Figure 2,3); underneath the dam, activated charcoal is placed and dietary supplements (*Chorella, Curcumine*) could increase mercury chelation in the body for a short period of time under the supervision of their physician [23]. The first basic preventive strategy is covering the patient's face with a surgical drape to prevent spattered amalgam particles from landing on their skin, or eyes. Providing the patient with piped–is also advisable -supplemental air- (Figures 2,3).

Often the particles are found on the sublingual tissues and lateral borders of the tongue, which is the fastest absorption route into the body. The dentist must check for the absence of these particles on the tongue during dental amalgam removal. Once the amalgam is completely removed, the protective coverings are taken away; the dentist must also inspect the floor of the mouth and tongue and remove possible particulates that may have set under the dam once all mucosal tissues are flushed by copious amounts of water. Patients must follow a simple and obvious protocol during dental amalgam extraction. Thus, the synergic use of nasal filters and ventilation techniques together with these basic protective protocols will reduce the amount of mercury exposure in patients and dental staff during amalgam removal (Figures 2,3,4).

In addition, the patient's face is draped under the dam, with a liner; goggles for the eyes plus a hair cap or bonnet protection during dental amalgam removal. During amalgam removal high volume suction and a continual addition of water should be applied to the site where the amalgam is being extracted. (ii) In addition, Nitrile dams are better vapor barriers than latex. Finally, the dentist must protect themselves with a filtered mask, eye and hair protection, and face shields as a common sense physical means of reducing exposure (Figures 1,2,3,4). During the process of dental amalgam removal, we must conducting the process under a constant water spray while cutting will keep the temperature down, and reduce the vapor pressure within the mercury. The amalgam restoration is sectioned and then scooped out to eliminate mercury vapor release [24,25]. The tool for removing mercury vapor and amalgam particulates from the operating field is high volume evacuation (HVE). It is necessary to remove the amalgam particulates following safe protocols, according to Environmental safety. One must also dissolve the mercury before discharging the wastewater [26]. The question of how to properly dispose of the contaminated rubber dam, patient drape, gloves, etc. has been barely addressed yet. We advise the use of rubber dams since the majority of the debris of amalgam grinding. 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. Of course both amalgam removal groups, dam or no dam, showed 50-75% reduction in blood mercury levels a year later [27]. However, we must consider that mercury vapor will diffuse right through the dam, and some of the particulates will often sneak past, too. Always use a saliva ejector behind the dam to evacuate air that may contain mercury vapor. Another study has found mercury and zinc ions released by corrosion of dental filling restorations in vacuum-formed thermoplastic seals [28]. As soon as the amalgams are out, remove the dam and thoroughly rinse the patient's mouth before placing the new restorations. Moreover, post-removal rinsing can be used to scavenge mercury from the patient's saliva [26,2]. Other basic strategy will be to maintain clean air in the operatory

area since particulates generated by removing amalgams are dispersed in the environment. Beyond opening the window, other strategies for mercury removal include ultrafiltration and negative ion generators, plus basic vacuum force to remove the air from the operative field in the works room (*Dent-Air Vac, E. L. Foust, Smart-Air Solutions, and Tact-Air*). Finally, the routine use of oxygen while removing dental amalgam in the clinic is not easy since rules and Directive for its use are different in each country. In addition, simply moving into another space can be effective in reducing mercury exposure.

Mercury toxicity can be aggravated by the possible galvanic interaction between heavy metals due to metal ions release in mouth [29, 28]. The conventional dental filling is more prone to galvanic corrosion than the higher copper containing amalgam in contact with the Co Cr Mo alloy as well as titanium. These released heavy metals could be quelated by curcuminoides [30,21]. Thus, if too many amalgam restorations are present in the oral cavity or close implants are close to amalgams, the galvanic interactions will released ions constituting an additional factor contributing to mercury toxicity. In fact, the release of mercury from silver amalgam exposed to different bleaching agents (10 % carbamide peroxide) may also increase the toxicity of mercury. Since bleaching agents are often employed in cosmetic dentistry; we must also consider the possible interactions between them and increased mercury vapor levels during treatments and steam in these treatments [31]. Nowadays, there is an aesthetic demand in all fields of odontology [32]. For example, the exponential increases of multidisciplinary orthodontic treatments in adult patients together with great advances in the development of new materials have improved aesthetic and functional techniques such as micro-implants in orthodontics [33]. During these multidisciplinary aesthetic treatments, the safe protocols for dental filling removal are not always implemented in patients [31,2]. On the other hand, electronic magnetic contamination can also contribute to the noxious release of mercury from dental amalgam fillings in synergy with magnetic fields [34]. Finally, dentists must use a certified hazardous waste carrier to recycle and dispose of amalgam waste and develop combined strategies for preventing mercury vapor toxicity in odontology. Thus, the use of synergic nasal filters (active carbon) together with dietary supplements (*Curcuminoids, Desmodium, Clorella,* and other antioxidants) would increase patients' endogenous detoxification capacities helping prevent heavy metal toxicity.

Finally, since dental amalgam could be a risk factor for populations with mercury susceptibility, it is crucial to develop new precautions and rules even though certain cause-effect relationships have not been firmly established (UNEP. United Nations Environment Programme; Minamata); http://www.unep.org/newscentre/default.aspx?**)** [37].

Interestingly, the Precautionary Principle states: "*The precautionary principle applies where scientific evidence is insufficient, inconclusive or uncertain and preliminary scientific evaluation indicates that there are reasonable grounds for concern that the potentially dangerous effects on the environment, human, animal or plant health may be inconsistent with the high level of protection chosen by the EU*¨. This aspect of precaution must be followed by dentists, who could prevent irreversible environmental risks as well as toxicity of heavy metals in patients [35, 36, 37].

3. Conflict of Interest

None to declare**.** All authors declare that there is not conflict of interest

4. Figures

Figure 1: Nasal filters of Active Carbon

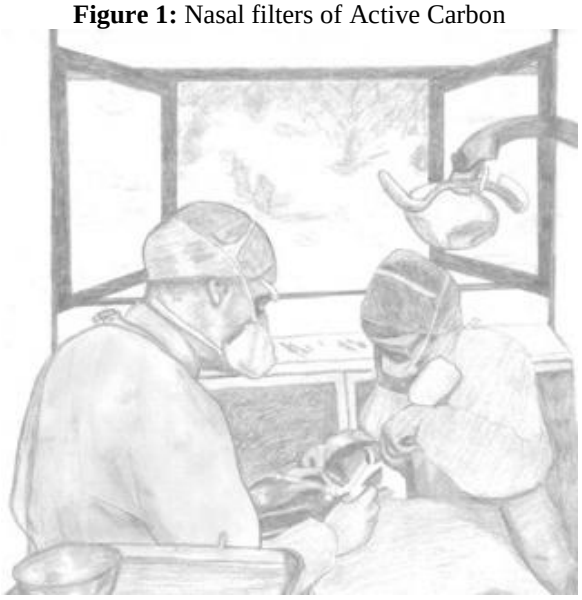

Figure 2: Safety protocol for dental amalgam extraction (patient and dentist)

Figure 3: The use of nitrile protection, glasses and nasal filter can prevent mercury contamination in patients (carbon active). His face was totally covered. This photo shows this nasal filter as alternative to the use of oxygen.

Figura 4 a, b. Nitrile plastic must be used before/after dental amalgam removal in patients.

Figura 5: a, b. Removal of dental amalgams by other safe and more biomaterial compatible.

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