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Review Article

Environmental Friendly and Waste Management in Dental Clinic – A Review

Dr.Rajul Vivek
Ph.D Research Scholar, Faculty of Dental Sciences, IMS, Banaras Hindu University

Corresponding Author- Dr.Rajul Vivek
Ph.D Research Scholar, Faculty of Dental Sciences, IMS, Banaras Hindu University

Abstract:
The environmental concern about mercury is that it does not degrade, but it can change from one form to another and will migrate through the environment. Under certain conditions in surface waters, microorganisms can convert some forms of mercury to methyl mercury, which is highly toxic. Fish and other aquatic organisms can absorb methyl mercury, and because fish cannot eliminate methyl mercury from their tissue, methyl mercury can bio accumulates up the food chain. Regular consumption of fish with methyl mercury in high enough concentrations can cause harm to both wildlife and humans. Dental amalgam has been the subject of attention by environmental regulators because it contains elemental mercury as a major component. Therefore, recommend that immediate steps must be taken to ensure appropriate preventive measures to avoid mercury vapours in order to prevent potential health hazards to dentistry personnel. Strong regulatory and administrative measures are needed to deal with mercury pollution on emergency basis. This paper discuss about the environmental health hazardous for dentist like mercury, lead, silver and other biomedical waste in dental clinic.

Key words: Dental Amalgam, Environmental health hazardous, Silver, Toxic effect

Introduction-

Dental amalgam is an alloy made by combining silver, copper, tin and zinc with mercury. Amalgam has been used to restore teeth affected by decay for more than a hundred years. More recently, other materials, such as composite resins, have provided dentists and patients with an option other than amalgam, and because composite restorations can match tooth color, they have become more popular than the silver colored dental amalgam. However, because of its greater durability and adaptability than alternative materials, amalgam is still considered the best option for certain restorations, especially where the filling may be subjected to heavy wear, or where it is difficult to maintain a dry field during placement. Also, because amalgam material is less costly than composite material, it often represents a more economical choice for patients. Notwithstanding these benefits, because mercury is a principal ingredient in amalgam fillings, there has been a persistent concern about how dental amalgam might affect patient and dental staff health and the environment. This paper addresses the environmental impact of dentistry and describes measures that can be taken by dental staff to reduce the production of potentially harmful and general wastes.

1. Mercury

Dental Amalgam

Although individual dentists generate only small amounts of environmentally unfriendly wastes, the accumulated waste produced by the profession may have a significant environmental impact.[1–3] Much concern in recent years has been the impact of heavy metal

contamination of water systems by dentists, particularly through the production of dental amalgam waste. Although dental amalgam is a durable, cost-effective and long-lasting restorative material,[4–8] It contains mercury, silver and other metals that can enter the environment.[8–12] Mercury is the heavy metal of primary concern, making up to 50% by weight of dental amalgam. Mercury is bio accumulating and is known to have toxic effects

in plants, animals and humans.[2,8,15–17] The scientific literature fails to identify a causal relationship between dental amalgam and adverse health effects, likely because the forms of mercury associated with dental amalgam are elemental and inorganic,18,19 which are less toxic than organic mercury.

The placement and removal of dental amalgam restorations generate solid and particulate wastes that can enter the environment if they are not properly captured and

managed. Once in the environment, changes in pH, oxygen availability, temperature, presence of other ions and actions of abrasion and corrosion can allow the mercury in

amalgam to be used by bacteria, which are able to convert it to the more toxic organic

methyl mercury. In bio available form, organic mercury can enter the food web, where

it tends to accumulate in higher organisms, particularly fish and birds. This has led to restrictions on human consumption of certain fish species to minimize the potential adverse health effects. [14,15]

Although it has not been demonstrated that the mercury in dental amalgam poses a direct threat to the environment, the practical approach to waste disposal by dental practitioners is to reduce its potential environmental impact.

Dental Amalgam Waste Products

During the placement and removal of dental amalgam restorations, a variety of waste products is generated[16]elemental mercury vapour — released from dental amalgam alloy dental amalgam scrap — the amalgam particles that have not come into contact with the patient (i.e., particles remaining in the dappen dish following restoration placement,amalgam waste — the particles that have come into contact with patient secretions (e.g., particles generated during carving and restoration removal procedures),amalgam sludge — the fine particles present in dental office wastewater, commonly trapped in chair-side traps and vacuum filters.

Best Management Practices-

Approximately 50% of environmental mercury is from natural sources, whereas approximately 42% of humangenerated mercury pollution results from the combustion of fossil fuels.[17] Currently, it has been estimated that dentists contribute between 3% and 70% of the total mercury load entering wastewater treatment facilities. Source elimination and reduction are our best defences against environmental mercury contamination, particularly as the behaviour of dental amalgam components in the environment is not fully known. Practitioners are encouraged to follow "best management practices" in the handling and disposal of dental amalgam [18] to limit its potential environmental effects. Best management practices apply to a variety of hazardous wastes and depend on the type of waste in question. They are designed to provide guidelines to practitioners to limit the occupational and environmental hazards of a particular substance. For mercury, best management practices are designed to address the various forms that are used and generated in the dental office. Practitioners are advised to use precapsulated dental amalgam to reduce the risk of liquid mercury spill or clinic–environmental contamination.

Practitioners are legally responsible for the collection, storage and disposal of both gross debris and fine amalgam particles removed via high-volume suction. At present, many dental offices have chair-side filtration devices, as well as secondary filters to protect vacuum pumps. These devices trap larger particles of dental amalgam. Chair-side traps have been found to be approximately 68% effective in their removal of amalgam particles from dental wastewater, while the average vacuum filter is approximately 40% effective. A number of ISO 11143-certified amalgam separators are able to reduce amalgam particles in dental wastewater by more than 95%.These devices separate the fine particles (generated during restoration finishing, polishing and removal procedures) from wastewater, thereby limiting the amount sent to wastewater management facilities or the environment.

Once collected, mercury and dental amalgam waste should be handled in the same manner as all hazardous waste; staff members should be properly trained and should use gloves, masks, gowns and protective eyewear when disposing of amalgam waste. Dental amalgam scrap as well as amalgam waste gathered by filters and separation devices should be collected periodically and stored in a labelled, leak-proof container (e.g., in a dry mercury-vapour suppressant system). Contact and noncontact amalgam waste should be stored in separate containers, as reclamation of the components can be complicated by the need to decontaminate contact waste. The proper storage of dental amalgam will also reduce the amount of elemental mercury vapour that enters the work environment.

Regardless of the means of disposal of dental amalgam, practitioners should not flush contaminated wastewater down sinks, rinse chair-side traps or vacuum filters in sinks, nor place material containing dental amalgam in general garbage or waste to be incinerated. These practices release mercury into the environment and negate the profession's efforts to reduce environmental mercury contamination.

Silver

Silver is another heavy metal that can enter our water system via improper disposal of dental office waste. Although silver is a component of dental amalgam, the silver thiosulfate in radiographic fixer (a solution normally used in the processing of dental radiographs) presents a greater environmental concern. Some forms of silver are more toxic than others; for example, silver thiosulfate is less toxic than free silver ions. Again, limits for silver concentration in wastewater are set by individual municipalities and jurisdictions and can be obtained through local environment authorities. Used radiographic fixer must not be washed down the drain. The best way to manage silver waste is through recovery and recycling. Dentists can install in-house silver recovery units to salvage the silver themselves, allowing for some monetary return on the equipment investment when the silver is later sold. These units generally recover silver ions from the waste solution through displacement of iron ions or through a closed-loop electrolytic system that recovers not only silver for reuse, but also the radiographic fixer. Alternatively, the waste can be collected by a registered agency certified to carry and manage the waste. [18]

With recent advances in radiographic technology, digital imaging is becoming a popular means of obtaining dental radiographs. Among its advantages are reduced radiation exposure and the absence of chemical image processing. Therefore, incorporation of digital imaging within the dental office can greatly reduce the amount of silver waste generated.

Lead

An additional by-product of traditional radiography is the lead shields contained in each film packet. Although the lead shields themselves are relatively small, the cumulative waste produced can be considerable. An added benefit of digital

radiography is the reduction in lead waste production. Lead, like mercury and silver, is toxic and persists in the environment.[19]Even at low levels of exposure; lead exerts adverse health effect on both children and adults. Reducing environmental lead contamination by dental practitioners is an inexpensive and easy task. The lead shields from film packets merely have to be collected and returned periodically to the manufacturer for recycling. The only cost is for postage. Unfortunately, some manufacturing companies report that only about 5% of products sold are returned. In part, it appears that this is due to a lack of awareness of the offered service.

Biomedical Waste

Biomedical waste encompasses materials capable of causing disease or suspected of harbouring pathogenic organisms it includes blood-soaked gauze, tissues and syringes[20] although not extracted teeth. Non-sharp biomedical waste products should be stored in a yellow bag that is properly labelled with a biohazard symbol. Sharps (i.e., syringes, suture needles) should not be included in the bagged general or biomedical waste, but should be stored in a puncture-resistant, leak-proof, properly labelled container until collection and incineration. Currently, Canadian guidelines for the storage and management of biomedical wastes are under revision. These practices can be modified by provincial and territorial governments and municipalities; therefore, it is best to contact local environment and waste transport authorities to ensure that proper procedures and regulations are followed within each jurisdiction.

General Office Waste

Although this article attempts to address some of the larger issues relating to the environmental impact of dentistry, dental staff can also implement a variety of other practices to make the dental office more environmentally friendly. Purchase of products with minimal packaging and use of reusable plastic containers (e.g., for cleaning and disinfecting solutions) can reduce general waste production. Products made from recycled or partly recycled materials can also be used (e.g., cotton or wool rolls, paper towels).[21] Energy-efficient lighting and temperature regulation can limit office energy use. Single-spaced printing and use of both sides of pages can decrease the amount of paper used in the dental office.

Conclusions

Dental practitioners are becoming increasingly concerned about the potential impact of dentistry on the environment and oft en take voluntary measures to reduce the production and release of environmentally unfriendly wastes from their practices. As health practitioners, we should be concerned with promoting not only human health and well-being but also that of the environment. A proactive approach will allow our profession to succeed in an era of increased public environmental concern and environmentally protective legislation. It is not only our legal obligation to provide dental services that benefit the public at minimal expense to the environment, but also our moral and ethical obligation.

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