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Knowledge, Safety and Attitude of Dentists Toward Dental Amalgam

Vladimir Panov

Department of Conservative Dentistry and Oral Pathology, Faculty of Dental Medicine, Medical University of Varna

Abstract

Dental amalgam is considered one of the most important materials in dental medicine. It has been widely used for more than two centuries. Since its inception, there has been much controversy over its ban, due to the release of mercury during its processing. Its use worldwide decreases, but it has not disappeared completely.

The majority of dentists in Bulgaria - 69%, use dental amalgam. Those who do not work with amalgam are significantly younger. The majority of dentists (80%) work with amalgam in capsules, 20% use a mechanical mixing machine, and 5% still apply manual mixing in a mortar and pestle.

One in four dentists who work with dental amalgam do not wear gloves when working with this material. Dentists with more professional experience are less likely to follow reasonable rules for working with dental amalgam.

In the majority of cases (69%) dentists have had a patient with complaints due to dental amalgam. They rarely report having patients with lichenoid reactions and burning, and one in four dental professionals has had such a patient. Nearly 38% of dentists have had a patient with an allergy to amalgam. Undoubtedly the most common side effect is the metallic taste in the mouth, reported by ¾ of dentists.

Only a quarter of dental doctors have an amalgam filter installed before pouring water down the drain. 72% report that they do not have any treatment facilities at the exit of the unit. Half of the dentists dispose of the remains of dental amalgam directly in the garbage. 55% of doctors apply amalgam only to molars, 95% to premolars and molars and 4.8% to premolars and molars, canines and incisors.

Within the limitations of this study, we can conclude that dental amalgam is well accepted by dentists and patients in Bulgaria. The majority of dentists believe amalgam is safe for patients and dentists. The ecological and health recommendations are not observed when working with this material. Side effects in the mouth, due to dental amalgam, are not uncommon.

Keywords: dental amalgam; dentists, health, safety, dental restorations

Introduction

Dental silver amalgam is considered one of the most important materials in dental medicine. It has been widely used for two centuries, although its composition has been changed many times (1). Since its inception, there has been much controversy over its ban, due to the release of mercury during its processing. Its use worldwide decreases, but it has not disappeared completely. In many countries dental amalgam is used to protect severely damaged teeth (2; 3). It is also relatively inexpensive when comparing to tooth colored materials, the durability of amalgam obturation may exceed these of alternative direct materials (4). Acceptable durability in amalgam restorations can be obtained in difficult operative conditions, unlike similar materials that require more sensitive protocol (1; 5; 6).
Al-Nahedh found in 2020 that 60% of specialists declare it safe. 32% of general dental practitioners and 41% of dentists consider a moral obligation to inform patients about the potential health risks associated with amalgam. Mercury vapor toxicity was identified as the most common health hazard. The majority of dentists found it safe, while the patients had little knowledge about the possible harmful effects. It is recommended that the public awareness of the impact of mercury containing products be enhanced (7). Fresh dental graduates used amalgam less frequently compared to experienced dentists (6). Furthermore, private dental practitioners showed a tendency to replace existing well-placed amalgam restorations with resin composite (8). Amalgam was well accepted both by dentists and patients in an investigation from 2008 (9). Awareness about dental amalgam is low among patients. Other investigations show that dentists do not use dental amalgam frequently and they do not agree with the ban of this material (10).

Knowledge regarding biomedical waste management among dentists is inadequate and poor. Regular training sessions and Continuing Dental Education on Biomedical waste management and updates have to be organized for the improvement of knowledge and practice among dentists (11). Most Jordanian dental practices are not eco-friendly. Focus on the impact of dental practices on the environment is needed through continuing dental education (12).

Aim

To investigate the knowledge, safety considerations and attitude of dentists towards dental amalgam, to study the form in which they apply it, whether they use protective equipment and to identify possible complaints reported by patients in relation with its use.

Materials and methods

In the framework of scientific forums in Bulgaria we studied data on the application and knowledge of dental amalgam among 104 dentists. We conducted the anonymous survey through a questionnaire developed by us in 2015.

Results

The majority of dentists - 69% work with dental amalgam in their practice, and their average work experience is 22.05 years (rank 10-36). We assume that the percentage is so high, as restorations made with this material are paid by the health insurance fund in Bulgaria. 31% of dentists do not work with dental amalgam.

The average length of their service is 14.4 years (rank 5-24), and it is noteworthy that these are generally younger dentists. The dentists who do not work with amalgam are significantly younger.
Of those working with dental amalgam, 40% apply it to pregnant women, 80% put it on deciduous teeth, 5% do not apply it to permanent teeth, but only to deciduous ones. 35% of dentists working with dental amalgam place it on both permanent and temporary teeth and use with pregnant women, which represents about 24% of all dentists. This is in line with a study from 2016 that found no evidence of serious perinatal effects of maternal exposure to amalgam fillings during pregnancy (13). On the other hand, research shows that the risk of perinatal death may increase in a dose-dependent manner based on the number of teeth restored with dental amalgam (14).

We studied the method of preparation of the amalgam. Some of the dentists apply different methods of mixing and therefore the percentage is over 100. With amalgam in capsules work 80% of dentists, which is in line with contemporary requirements, 20% use a mechanical mixing machine, and 5% still apply manual mixing in mortar and pestle (Fig 1).

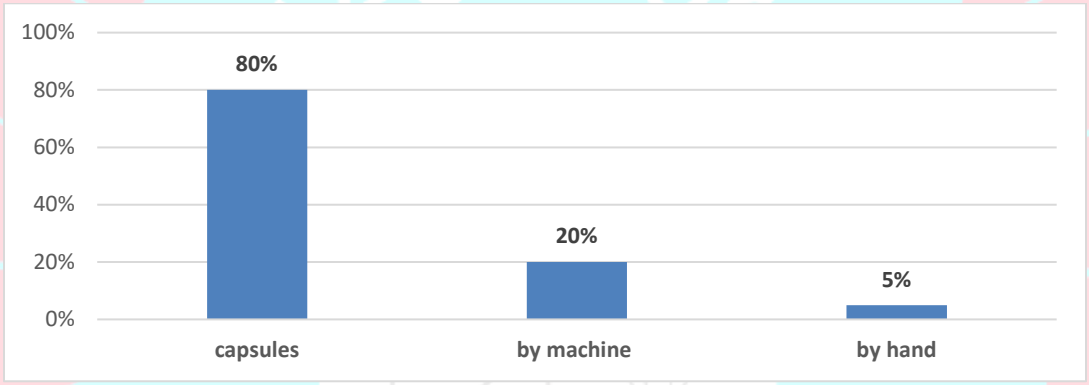

Figure 1. Method of preparation of amalgam

Dentists who use machine mixing have an average work experience of 21 years (rank 20-22), doctors using manual mixing have an average work experience of 36 years. Dentists using only capsules have an average work experience of 21.4 years (rank 10-35).

Of all dentists, 13.8% propose to remove old amalgam obturation, even if it is in good condition.

Figure 2. Use of gloves when working with dental amalgam

One in four dentists who work with dental amalgam do not wear gloves when working (fig 2). In this group the average years of service is 24.2 years (rank 20-36). Dentists with more professional experience are less likely to follow reasonable rules for working with dental amalgam. Those who wear gloves at work have an average work experience of 21.3 years (rank 10-35). Mercury concentrations in nails are significantly lower among dentists who always use gloves and masks (15).
Amalgam is a reliable restorative material, having in mind its relatively frequent use and the low number of reported adverse reactions, as well as the rare changes in the oral mucosa caused by the alloy (6).

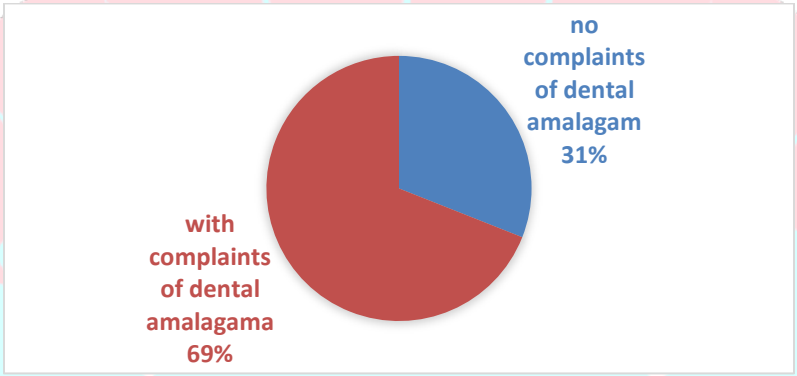

Figure 3. Distribution of dentists who had patients with complaints due to dental amalgam.

31% of dentists have never had a patient with complaints due to dental amalgam. In the majority of cases (69%), dentists faced such problems (fig 3).

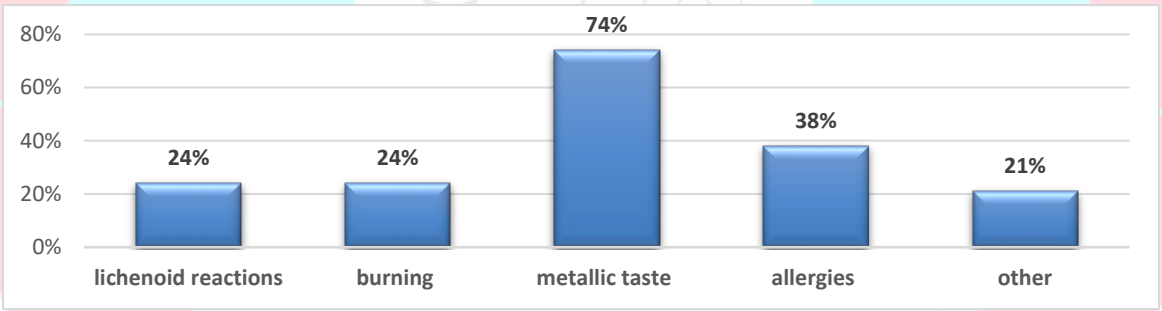

Figure 4. Complaints due to dental amalgam

Dentists sometimes report having patients with lichenoid reactions and burning, and one in four dental professionals has had such a patients. Nearly 38% of dentists had a patient with an allergy to amalgam. Undoubtedly the most common side effect is the metallic taste in the mouth, reported by ¾ of dentists (fig 4).
As all dental restorative materials are foreign substances, their potential to cause adverse health effects is determined by their relative toxicity and bioavailability, as well as by the sensitivity of the host. Adverse health effects of tooth restoration can be local in the oral cavity or systemic, depending on the ability of the released components to penetrate the body and their rate of absorption (16).
Reactions of the oral mucosa with the use of amalgam are mainly in the form of lichenoid lesions. Oral lichenoid lesions caused by contact with dental amalgam are clinically or histologically difficult to distinguish from other lichenoid lesions or from idiopathic oral lichen planus. They can be caused by contact hypersensitivity. Direct contact or accidental implantation of amalgam into the mucosa results in an

amalgam tattoo. Of 92 amalgam fillings, we have found only one amalgam tattoo, which is less than 1%. In 46 of the obturations, the amalgam was in close constant physical contact with soft tissues, but there was no coloration of the gingiva. The lesions are most often asymptomatic, and patients rarely report pain or hypersensitivity when consuming hot or spicy foods (1; 6).
Rare cases of allergic reactions are described in about 4% of the tested patients, explained by the high oral tolerability and adaptive abilities of the oral cavity (17). Also, the values of the corrosion potential rarely exceed the norm - only 4% of the tested samples, despite the presence of more than one metal in the same oral cavity (18).

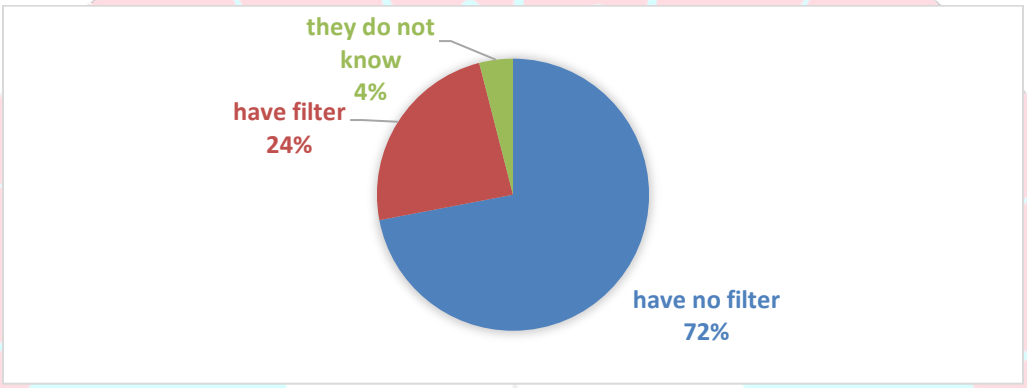

Figure 5. Presence of a purifying filter at the outlet of the dental unit

Only a quarter of practicing dentists have an amalgam filter installed before pouring water down the drain (fig 5). 72% report that they do not have any treatment facilities at the exit of the unit. We assume that the 4 percent who do not know also do not have a purification device. Our research shows that the majority of dental offices directly dispose of excess dental amalgam in the sewer. The percentage of purification is probably even lower, as we have not taken into account the maintenance and replacement of the filters.

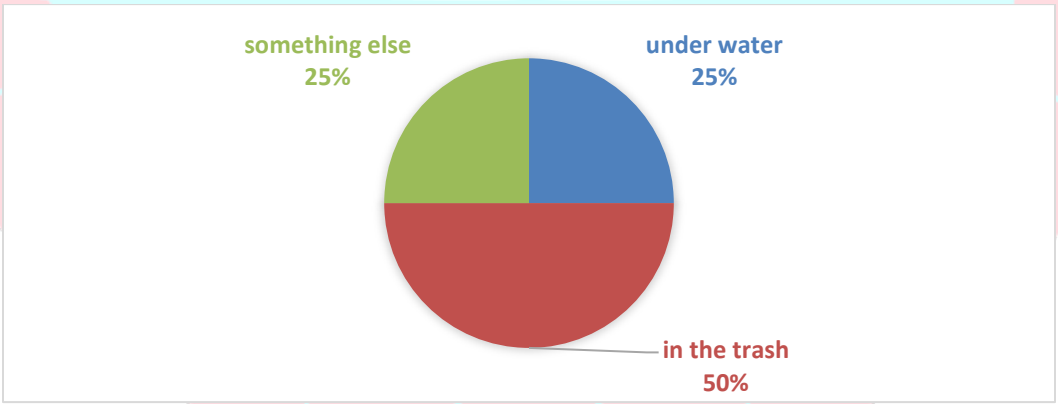

Figure 6. Behavior with excess or residue of amalgam

Half of the dentists dispose of the remains of dental amalgam directly in the garbage, one in four stores it according to the rules for handing over to the licensed companies for purchase and storage of hazardous waste, and 25% report "other" dispoal methods (fig 6). Given that some dentists use a mortar and pestle, we can assume that old amalgam particles are still being refreshed for new use.

Due to the toxic properties of mercury and bioaccumulation, amalgam separators were introduced for the wastewater discharged from dental offices in Sweden in the 1980s. These amalgam separators in the filtration process are required to remove at least 95% of the incoming Hg (19). Mercury, used in products and processes, including dental amalgam, is a global pollutant. State regulatory agencies should make obligatory the use of capture technologies to reduce mercury pollution (20).
However, dentists, as producers of amalgam waste, have a responsibility and obligation to take care of the proper management of this waste within their practices (21).

55% of dentists apply amalgam only to molars, 95% to premolars and molars and 4.8% to premolars and molars, canines and incisors. Only 19% of dentists place such fillings in first class cavities. This is in line with the measures adopted in Sweden in 2002 to limit the use of dental amalgam and to put the material only in cavities far from soft tissues. 28.6% of the dentists place amalgam fillings only in second class-cavities. The same is the percentage dentists that use it to obturate first and second classes cavities. About 10% of all dentists place it in all classes of cavities. Less than 10% of dentists would place amalgam on a 5-th class cavity.
Nearly three quarters (72%) think that oral hygiene is important when choosing this material.

Discussion

The use of dental amalgam has declined significantly during the past decades. In 2017 it was less than 3% of all restorations placed in Denmark (22). Some countries like the Netherlands, Finland and Japan successfully gradually decrease the use of this material. Denmark and Finland issued guidelines recommending mercury-free alternatives. Sweden and Norway established a prohibition on amalgam use (23).
A smaller percentage of dentists find amalgam safer compared to other materials not containing mercury (24). A significant number of specialists find that it is important to inform patients about the possible health risks of using dental amalgam (25). Composites and glass ionomers were identified as the most preferred alternative restorative material (24, 26)
The majority of the patients have no knowledge about amalgam, a small number were aware of the mercury content of amalgam. Patients have no knowledge about the possible problems due its use (27). Few patients consider that amalgam fillings may have effects on their health (7). The majority of patients did not know much about the material. The majority of the patients consider longevity the chief factor for placing dental amalgam. This finding is in agreement with more of the published results (6; 24). The reduced use of this material is largely due to the aesthetic needs of patients (1).
The analysis of the literature shows the availability of information and studies on the contamination of the incoming dental unit water. Not much information can be found in the relevant literature about dental unit waste-water (28). In Ontario in 2004 approximately 22% of the dentists reported using amalgam particle separators (29). Mercury used in dental amalgams is a global pollutant. Usually mercury dental amalgam toxic effect continues for years, because of its bioaccumulation (20). The effectiveness of the amalgam separators is determined on the basis of the amount of mercury in wastewater. The assessment of the efficiency of separators is based on particle removal by weight, not by concentration (30).
It is important to improve the available information about the effects of mercury containing products on health and the environment. Precautions must be taken to guarantee proper use, and that the disposing of mercury is performed by the dentists according to recommendations since a majority of them still use this material (27).

Conclusion

The majority of dentists - 69% use amalgam in their practice. Those who do not work with amalgam are significantly younger.
80% of dentists work with amalgam capsules, which is in line with modern requirements. Unfortunatly 20% use a mechanical mixing machine, and 5% still apply manual mixing in a mortar and pestle - outdated methods that are not recommended today.
One in four dentists who work with dental amalgam do not wear gloves when working with this material. In this group the average work experience is 24.2 years (rank 20-36). Dentists with more professional experience are less likely to follow reasonable rules for working with dental amalgam.
31% of dentists have never had a patient with complaints due to dental amalgam. In the majority of cases (69%) colleagues faced such problems.
Dentists rarely report having patients with lichenoid reactions and burning, and one in four dental professionals has had such patients. Nearly 38% of dentists have had a patient with an allergy to amalgam.
Undoubtedly the most common side effect is the metallic taste in the mouth, reported by ¾ of dentists.
Only a quarter of practicing dentists have an amalgam filter installed before pouring water down the drain.
72% report that they do not have any treatment facilities at the exit of the unit.
Half of the dentists dispose of the remains of dental amalgam directly in the garbage, one in four stores it according to the rules for handing over to the licensed companies for purchase and storage of hazardous waste.
55% of dental doctors apply silver amalgam only to molars, 95% to premolars and molars and 4.8% to premolars and molars, canines and incisors.
According to the majority of dentists, leading in their considerations for choosing an obturating material is the level of personal oral hygiene.

Within the limitations of this study, we can conclude that dental amalgam is well accepted by dentists and patients in Bulgaria and the majority of dentists believe amalgam is safe for patients and dentists. The ecological and health recommendations are not observed when working with this material. Side effects in the mouth, due to dental amalgam, are not uncommon.

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Corresponding author:
Vladimir Panov, DMD, PhD, DSc,
Professor, Department of Conservative Dentistry
and Oral Pathology, Faculty of dental medicine,
Medical University – Varna,
email: vladimir.panov@mu-varna.bg