

Mercury release from a two surface amalgam restoration

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ABSTRACT

Mercury release from a two surface amalgam restoration has been determined in blood and urine at different time interval after performing amalgam restoration. The results showed that the average mercury released in blood reached relatively the level that was before restoration to be done after 3 weeks .

Key words: Mercury release, amalgam restoration.

الخلاصة

تم قياس كمية الزئبق المتحرر من حشوة أملغم من الصنف الثاني الى الدم والادرار . لقد تبين في النتائج ان كمية الزئبق تصل الى النسبة الطبيعية في الدم بعد ثلاثة اسابيع من اجراء حشوة الاملغم .

INTRODUCTION

Most people are regularly exposed to some level of mercury through natural man made environments, usually both. The biological effects of mercury, like those of most heavy metals are dose dependent and there is a biological capacity to tolerate mercury up to normal health ^(1,2) . Mercury is a major component of silver amalgam , it is the most commonly used dental restorative material world wide . The release in vivo of micro levels of a volatile mercury from amalgam restoration has been confirmed ^(1,3) .

Mercury concentration in urine and blood are commonly used to asses the mercury burden ⁽¹⁾ . It is generally accepted that these levels reflect the contributions from food and amalgam . Because of the dependence of conventional dentistry on amalgam for routine decayed teeth in Iraq . A trend towards an amalgam free society would be difficult, therefore dental amalgam like all medical devices and medicines and therapeutics needs periodic assessment of the respective risks to benefits , No previous study had been done in Iraq. Therefore the purpose of this study is to determine mercury released from two surfaces amalgam restoration at different time intervals .

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MATERIALS AND METHODS

To determine the mercury level in blood and urine , it is necessary to have standard curve which correlate the data obtained between standard solution with different mercury concentrations .

Mercury concentrations of 1,2,5,10 and 15 ppm had been prepared then for 20 ml of each concentration,250ml of concentrated HNO₃, 250 ml of KMnO₄ and 9.5 ml distilled water were added. Shimatso Flamphotometer was used for performing all calculations . Then 0.5 ml of 10% trichlor acetic acid and 1drop of 1/1 HNO₃ were added to 1m of collected serum sample . Each sample centrifuged with 4000 rpm for 10 minutes , then to each 1ml of super rate a 2.5 ml ethanol , 250 ml concentrated HNO₃ , 250 ml of 0.5 KMnO₄ and 1m distilled water were added. Thirty patient with no previous filling were involved in this study.

A two surface amalgam restoration was performed for each patient SDI capsule (Southern dental industries Limited) triturated with Quyal dental amalgamator for 30 second was used for each restoration. Blood and urine samples were collectec' at the same times interval from each patient once before starting restoration and three times after performing the amalgam restoration, two hours, 24 hours and 21 days.

RESULTS

Table (1) shows the range and average of mercury released in blood and urine from a two surface amalgam restoration. The results show that mercury release increased within the first 24 hour and start to decrease gradually while excretion of released mercury start immediately within the first two hours after amalgam restoration and continue to increase with time. Therefore the total mercury released from the two surface amalgam restoration range between 1.36-1.92 ug/dl.

Table (1) : The average and the range of mercury release from amalgam restoration . (ug/dl)

	Before	After		
		2 h	24 h	21 day
Blood	(0.26-0.57) 0.42	(0.42-0.71) 0.56	(0.42-1) 0.82	(0.25-0.64) 0.44
Urine	(0.1-0.3) 0.4	(0.6-0.8) 0.8	(1.0-1.2) 1.1	(0.5-1.4) 0.92
Total	0.82	1.36	1.92	1.36

DISCUSSION

The risk of mercury toxicity arising from dental amalgam is generally accepted un-proven except in rare case of local allergies⁽⁴⁾.

Richardson (1995)⁽⁵⁾ estimated the level of mercury exposure that was considered tolerable for the majority of population. He concluded that the published data in potential effect of dental amalgam was insufficient to support or refute the diverse variety of health effects attributed to it. He calculated 0.014 mg/kg body weight as the recommended tolerable daily intake for mercury vapor driven from amalgam.

In this study the maximum mercury release was at 24h after amalgam restoration but it gradually decreased within 3 weeks. The results showed that the average mercury released in blood reach relatively the level that was before restoration to be done, and urine act to excrete and reduce this level in the body. However the total value of mercury release from an amalgam restoration was very small it was below the acceptable level in blood and urine. Richardson found no evidence of any relationships between mercury burdens and illnesses.

Kim (1994) concluded that exposure to mercury from dental amalgam is unlikely to be a health hazard⁽⁶⁾. Halbach (1995)⁽⁷⁾ indicated that the combined mercury in take from food and amalgam source does not exceed acceptable daily in take and that blood and urine concentration are less than 10% of critical values commonly associated with the onset of early or sub clinical effect of mercury. The majority of estimates in the range of 1-5 mg/per day for mercury exposure from dental amalgam exist. Using this range the estimated actual weekly does of mercury is 7 to 35 mg.

The WHO report in 1991 included some studies which reported sub clinical effects at estimated occupational exposures between 30 and 50 mg/m³. Therefore the weekly absorbed does from occupational exposures associated with sub clinical effect can be calculated as 1200 to 2000 mg. Based on almost all studies available on mercury release from dental amalgam before 1992, the average daily up take by inhalation was calculated to be 1.3 mg (range 0.3-2.2mg) and the corresponding uptake of mercury swallowed was found to be less than 1mg⁽⁴⁾. The total absorbed dose for the individual in the studies of Bergland (1990) and Bergland and Molin (1996) was averaged 3.0 mg per day, rang (0.6-9.3)^(8,9).

The U.S report 1993 noted that sign and symptoms of neurotoxicity were seen following exposure greater than 50mg/m³ in air or urinary level of 100 mg/l.

Therefore the results of this study are in agreement with the previous studies and the results also recommend the using of amalgam capsule which control the amount of mercury release and provide a safe technique for the patient and the dentist. Further studies are required to determine the mercury release from different number of amalgam restoration and different products to evaluate the effect of unfair embargo that imposed on Iraq on the availability of tools and suitable dental services requirements.

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