



**Karolinska
Institutet**

Department of Dental Medicine

Health Implications of Dental Amalgam

AKADEMISK AVHANDLING

som för avläggande av medicine doktorsexamen vid Karolinska
Institutet offentligen försvaras i Sal 9Q, Alfred Nobels Allé 8

Fredagen den 22 mars, 2013, kl 09.00

av

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Stockholm 2013

ABSTRACT

Dental amalgam is one of the most widely used, but also the most controversial of dental restorative materials. Since its introduction during the first half of the 19th century, concerns have been raised about health hazards related to the toxicity of a major component of amalgam, mercury. This has been a particularly contentious issue in Sweden, where amalgam use was discontinued in 2009, on environmental grounds. Two aspects of particular concern are the release of mercury vapour from dental amalgam fillings in patients and occupational exposure to mercury in clinical dental personnel handling amalgam. The aims of this thesis were twofold: to follow the progress of patients with health problems which they attribute to dental amalgam fillings and secondly, to investigate whether the offspring of female dental personnel handling amalgam were at increased risk of adverse effects from potential exposure to mercury vapour *in utero*. **In Study I** we examined symptoms, perceived health changes over time and health-related quality of life (HRQoL) among applicants for subsidized replacement of amalgam fillings. We used a questionnaire to collect data. The results showed that the applicants had a wide range of symptoms and that their HRQoL was much poorer than in the general population in Sweden. **Study II** documented the use of social security benefits by applicants for replacement of amalgam fillings. The data were retrieved from Swedish registers for the years 1994 to 2006. The cohort of dental filling replacement patients had a significantly higher number of days on sick leave and disability pension than the general population. These differences increased during follow-up. In the replacement cohort, the highest number of sick-leave days was recorded in the year they applied for subsidized replacement of fillings. While sick leave decreased following the year of application, the number of days on disability pension increased and peaked at the end of follow-up. **Study III** compared cognitive function among the sons of female dentists and dental nurses with that of sons of female physicians and assistant nurses. The aim was to determine whether the sons of female dentists and dental nurses had been harmed by the mothers' potential occupational exposure to mercury while handling amalgam. The cognitive test scores were for a test undergone by all young men in Sweden when they were conscripted for military service. Data were retrieved from national registers. Sons of dental workers had cognitive function test results similar to, or higher than their comparison cohorts. **Study IV** investigated the risk of early mortality among the sons of female dental personnel. Using data from the national registers, neonatal, infant and childhood mortality rates were compared for the sons of dental and of non-dental health care personnel. The sons of female dentists were compared with those of female physicians and the sons of female dental nurses with those of female assistant nurses. Analysis of data from the 1960's disclosed a statistically significantly higher risk of neonatal mortality among the sons of dental nurses than the sons of assistant nurses. In the subsequent two decades, this difference no longer reached statistical significance and a trend test demonstrated a consistent decrease in risk over the three decades (1960's, 1970's and 1980's). The following conclusions may be drawn from the results of the studies:

- A) In patients who attribute their poor health to their amalgam fillings, replacement of the fillings does not seem to lead to marked improvement in quality of life; HRQoL is well below the national average. Nor does filling replacement facilitate a return to workforce participation: in the years following filling replacement, these patients remain largely reliant on sick-leave or disability benefits. While the decreasing use of amalgam in recent years and its discontinuation from 2009 should lead to fewer and fewer people claiming amalgam-related ill-health, failure of current measures to improve the HRQoL in these patients and facilitate their return to the workforce is not only unsatisfactory for the individual patients, but also unacceptable to society. Further research is warranted to find ways of improving the status of these patients.
- B) There is no evidence that exposure to mercury vapour *in utero* has an adverse effect on the cognitive function of the offspring of female dental professionals who handled amalgam during pregnancy. For the decade of highest use of amalgam, higher rates of neonatal mortality, but not of infant or childhood mortality, were disclosed among the offspring of female dental professionals.
- C) In Sweden, amalgam use decreased during the 1970's and 1980's and was finally discontinued in 2009. Thus the potential hazards of mercury exposure from amalgam fillings in patients and occupational exposure in dental personnel handling amalgam, no longer apply in Sweden. Nevertheless, these findings on the health implications of dental amalgam, reliably supported by the Swedish national registers, provide an important frame of reference for countries with high caries activity, where amalgam use remains high.