USE DENTAL TECHNICIANS

Chemical Hazards in Dental Laboratories

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Exposure to methyl methacrylate can cause dermatitis and local neurological disorders in the exposed hands of dental technicians. In a study of 293 technicians, subjective symptoms were investigated and it was found that 81% were handling acrylic monomer daily without skin protection and 17% reported local dermatological problems resulting from dermal exposure **[41]**.
Other symptoms such as whitening of the skin and feelings of numbness, coldness and pain of the fingers were reported by 25% of respondents. Further investigation showed that dermal exposure to methyl methacrylate caused reduced sensory conduction velocities in the finger nerves of technicians who complained about numbness **[19]**.
There was no statistically significant difference in the distal sensory conduction of nerves in fingers of the dominant and non dominant hands although the sensory conduction velocities of finger nerves of the dominant hand in cases with exposure were significantly slower. In addition, a correlation between the feeling of numbness and decreased conduction velocity as compared with the non-dominant hand was found **[19]**.
The results of these studies clearly showed that methyl methacrylate is a sensitising, irritating and neurotoxic chemical which must be handled with appropriate protection. Methyl methacrylate monomer can penetrate through intact skin and this dermal absorption may be much higher among dental technicians with dermatitis, therefore, accelerating the neurotoxic effects on exposed hands.

41 Rajaniemi R, Tola S: Subjective symptoms among dental technicians exposed to the monomer methyl methacrylate. Scand J Work Environ Health 1985;11:281–286.

19 Rajaniemi R: Clinical evaluation of occupationaltoxicity of methyl methacrylate monomerto dental technicians. J Soc Occup Med 1986;36:56–59.

USE DEVICES PATIENTS

The release of residual monomeric methyl methacrylate from acrylic appliances in the human mouth: an assay for monomer in saliva.

J Dent Res 1988 Oct; 67 (10): 1295-9.

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Abstract

A gas-liquid chromatography assay has been developed for the estimation of methyl methacrylate monomer (MMA) in whole saliva, with a lower limit of detection in the order of 1 microgram/mL. Healthy human dentate subjects wore recently made autopolymerized or heat-polymerized polymethyl methacrylate (PMMA) palatal appliances. MMA released into saliva was detected for up to one week after insertion of autopolymerized appliances, with a maximum concentration of 45 micrograms/mL in whole saliva or 180 micrograms/mL in the salivary film on the fitting surface. The MMA was not detected in blood or urine. MMA was also present in the saliva of volunteers wearing appliances which had been heat-polymerized at 70 degrees C for one hr but not cured at 70 degrees C for three hr. The maximum amount of monomer released by an autopolymerized base plate was 29.5 micrograms in the first hour, which, while not a toxic or primary irritant dose, could possibly sensitize patients or elicit an allergic reaction. For minimization of monomer release, autopolymerized appliances should be immersed for 24 hr in water before being worn

USE IN THE ORAL CAVITY

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Cytotoxic effects of dental resin liquids on primary gingival fibroblasts and periodontal ligament cells *in vitro*

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SUMMARY Cytotoxic effects of resin liquids of three *in situ* relining dental polymers, Alike™, Kooliner, and Tokuso Rebase, and their major components, methyl methacrylate (MMA), isobutyl methacrylate (IBMA), and 1,6-hexanediol dimethacrylate (1,6-HDMA) were investigated. The concentrations of major monomers in these resin liquids were determined by high-performance liquid chromatography. Cellular viability of human gingival fibroblasts (GF) and periodontal ligament (PDL) cells were evaluated by the 3-[4,5-dimethylthiazol-2-yl]-2,5 diphenyltetrazolium bromide assay. Moreover, patterns of cell death were analysed using annexin V/propidium iodide staining with flow cytometry. The results indicated that Alike™ liquid contained 91·3% MMA, Kooliner liquid contained 94·5% IBMA, and Tokuso Rebase liquid contained 65·8% 1,6-HDMA. All materials examined had cytotoxic effects on GF and PDL cells in dose-dependent manners. Tokuso Rebase liquid appeared to be the most cytotoxic among the various resin liquids examined. The effects of Kooliner and Tokuso Rebase liquids may have resulted from IBMA and 1,6-HDMA, respectively. Furthermore, the majority of treated cells died from necrosis; whereas a small portion of cells died from apoptosis. In conclusion, the results demonstrated that these liquid forms of dental polymers and their major monomers cause cytotoxic reactions. The direct relining procedure that cures these materials *in situ* should be used cautiously.

KEYWORDS: resin liquid, methyl methacrylate, isobutyl methacrylate, 1,6-hexanediol dimethacrylate, high-performance liquid chromatography, cytotoxicity

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