

Surgical rubber gloves impervious to methylmethacrylate monomer

Conventional surgical rubber gloves are pervious to the methylmethacrylate monomer (MMM) of acrylic bone cement. An *in vitro* technique was used which proved butyl rubber gloves, 0.48 mm thick, to be impervious to MMM. To avoid sensitization, butyl rubber gloves may be recommended to persons who are in contact with MMM. Such gloves should be worn by persons with known contact sensitization to MMM.

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Acrylic bone cement is a mixture of a liquid and a powder. The liquid part consists of methylmethacrylate monomer (MMM), which is stabilized by the addition of a small amount of ascorbic acid and also contains 2 per cent of dimethylparatoluidine, which is a catalyst. The polymer powder consists of polymethylmethacrylate granules 97.5 per cent and benzoyl peroxide 2.5 per cent, the latter being the activator (Pegum & Medhurst 1971).

Ordinarily used surgical rubber gloves are not impervious to MMM (Pegum & Medhurst 1971, Fries et al. 1975, Waegemaekers et al. 1983). Contact sensitization and toxic dermatitis to MMM have been reported in orthopedic surgeons and nurses, and these conditions cause long periods of unfitness for work (Pegum & Medhurst 1971, Fries et al. 1975, Fischer 1979, Vedel et al. 1983, Fregert 1983).

To prevent the penetration of liquid chemical agents with high toxicity, new rubber gloves, especially butyl rubber, have been developed. The purpose of this study was to investigate the permeability of MMM through both butyl rubber gloves and the commonly used surgical rubber gloves (Latex).

Material and methods

A sterilized butyl rubber glove, with a thickness of 0.48 mm, and a Latex surgical glove were tested. A finger was cut off each glove and half filled with

powdered polymethylmethacrylate. The tips of the glove fingers were immersed in a metal cup containing MMM. After 25 min, the glove fingers were removed from the monomer. Changes in the powdered polymethylmethacrylate were noted, indicating that MMM had diffused through the glove during the immersion period. Macroscopic changes in the gloves were also noted.

Results

In the Latex glove, the polymer powder was found to have set solid and the glove itself showed clearly visible wrinkling. The butyl rubber gloves did not show any macroscopic changes and the polymethylmethacrylate was unchanged.

Discussion

Surgical rubber gloves impervious to methylmethacrylate monomer have not previously been available. It has been shown that multiple layers of ordinary surgical gloves tend to retard and reduce the diffusion of MMM proportionally to the number of layers, but all diffusion of MMM cannot be prevented in this way (Fries et al. 1975). Our *in vitro* technique has shown butyl rubber gloves, 0.48 mm thick, to be impervious to MMM during the test period. With this technique, macroscopic changes in the polymethylmethacrylate were re-

gistered. However, it is still possible that a small amount of MMM diffused through the glove without being sufficient to produce macroscopic changes in the polymer powder.

The 25-min test period was chosen as the maximum time a surgeon or a nurse might be in contact with acrylic bone cement during an operative procedure. The use of butyl rubber gloves 0.48 mm thick will not restrict the nurse or the surgeon significantly during the handling of the bone cement or insertion of the prosthetic components.

In *in vivo* experiments we have recently shown that the use of butyl rubber gloves while handling MMM was capable of preventing skin eruptions in an orthopedic nurse with known contact allergy to MMM (Kassis et al. 1983). We conclude that butyl rubber gloves may be recommended to persons who are in contact with MMM, to avoid sensitization, and should be worn by persons with known contact sensitization to MMM.

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