Management of a cataract patient with known allergy to methyl methacrylate

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We report the management of a 78-year-old woman with cataract and a known allergy to methyl methacrylate (MMA). Intolerance to a dental prosthesis 34 years earlier led to a patch test, which confirmed contact allergy to MMA. Currently, the most commonly used IOLs are made of acrylic materials because of good ocular biocompatibility. In this case, we chose an acrylic-free silicone IOL and carefully assessed disposables and instruments for the presence of acrylates. The risk for complications caused by contact allergy to MMA could thus be prevented. The mechanism of acrylate allergy and the principles for allergy testing are reviewed.

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Phacoemulsification with insertion of an intraocular lens (IOL) yields an inflammatory response due to both the surgery and the insertion of a foreign body. Intraocular lenses manufactured from various material such as poly(methyl methacrylate), silicone, and foldable polyacrylic elastomers are biocompatible and well tolerated by the eye.1 Polyacrylic elastomers appear to have superior biocompatibility as evaluated by morphometric analysis of foreign-body reactions and by clinical parameters such as aqueous flare, posterior capsule opacification, and need for neodymium:YAG capsulotomy.2

During phacoemulsification, the blood–aqueous barrier is disrupted1,2 and in sensitized patients, this may elicit allergic reactions to injected or implanted materials, such as an IOL. We report the management of a 78-year-old woman with cataract and a known contact allergy to methyl methacrylate (MMA). The mechanism of acrylate allergy and the principles for allergy testing are discussed.

CASE REPORT

A 78-year-old woman was referred to our clinic for cataract surgery. Corrected distance visual acuity (CDVA) was reduced to Snellen 0.8/0.4 due to bilateral nuclear cataract. The patient reported contact allergy to MMA. In 1979, the patient had been fitted with an upper dental prosthesis. In the following months, she experienced a burning sensation and irritation of the mucosa in her upper palate in close contact with the prosthesis. The dentist suspected a contact allergic reaction to the prosthesis and referred her to the Department of Dermatology, Aarhus University Hospital. The patient was patch tested with the dental-prosthesis series, which in 1979 consisted of 11 allergens including MMA, and supplemented with the material for a new prosthesis (Caston 99 and Copredon 99). The patch test showed a strong positive reaction to MMA and confirmed contact allergy. A new prosthesis without methacrylate was well tolerated.

At the first visit to the eye clinic, the contact allergy to methacrylate was discussed. The patient declined further patch testing and an IOL containing any form of acrylate. It was decided to avoid acrylates completely.

Our standard implant is a 1-piece acrylic hydrophobic foldable IOL made of 5 polymerizable comonomers: ethyl acrylate, ethyl methacrylate, 2,2,2-trifluoroethyl methacrylate, ethylene glycol dimethacrylate, and the ultraviolet chromophore 2-(4-benzoyl-4-hydroxyphenox)-ethyl acrylate. For this patient, a KS-3AI IOL with a silicone optic and polymide haptics (Staar Surgical Co.) was used. This IOL is preloaded in an acrylate-free injection system. Our
usual instruments and suppliers were used for the remaining procedures. Alcon Danmark A/S gave written confirmation that all disposable items in their custom pack were free of acrylate. Abbott Laboratories, Inc., in the United States confirmed in writing the absence of acrylate in the syringe and needle of the ophthalmic viscosurgical device (sodium hyaluronate 1.4% [Healon GV]). The product information of all additional disposables was checked; none contained acrylate. Nondisposable instruments were handled, cleaned, and stored in an acrylic-free environment.

The surgery was uneventful, and the 6-month follow-up confirmed a good final result. The CDVA was 1.2 (+1.5 \(-0.75 \times 59\)/1.0 (+1.0 \(-0.5 \times 99\). There was no reaction in the anterior chamber and no secondary cataract (Figure 1).

**DISCUSSION**

Contact allergy to MMA is a type IV hypersensitivity reaction in which antigen-specific T lymphocytes induce a delayed immune response on recognition of MMA. Once a person has become sensitized to an allergen, the contact allergy is lifelong, although the allergic response may fade with time. To investigate type IV allergy, the dermatologists use the patch test in which standardized allergens are applied in Finn chambers under occlusive dressing on the upper back for 48 hours. The chambers are then removed and readings are performed at 3 and 7 days. A positive reaction is shown as eczema and is graded 1 to 3. The patch test is a bioassay, and sensitivity can vary over time. The specificity of the patch test is very high. Only closely related chemical compounds exhibit cross reactivity. A recent study implies that exposure to acrylates does not normally induce cross reactivity to methacrylates, whereas exposure to methacrylates may induce cross allergy to acrylates.

Acrylates are commonly used in several settings, such as dentistry, orthopedic surgery, cosmetics, and graphic and clothing industries. They are a well-known cause of occupational contact dermatitis. Less commonly, they may cause conjunctivitis, rhinoconjunctivitis, rhinitis, and asthma. Methyl methacrylate is a common allergen in dental prosthetic materials. Several monomers and oligomers form polymer acrylics. Acrylate monomers are strong sensitizer, whereas the polymers are nonsensitizing, but impurities in the polymerized acrylates may leave residual monomers. The prevalence of acrylate allergy in the general population is unknown. However, in a study using data from Sweden and Singapore, the prevalence of acrylate allergy in a patch-tested population ranged from 1.0% to 1.4%. Reports of occupational contact dermatitis in dental personnel show that acrylates were the cause of allergy in 22% and 25% of all examined patients in Sweden and Poland, respectively.

A case report from the odontological field describes this type of contact allergy: A patient had worn acrylic dental prostheses for 10 years without problems. She developed an oral erythema, edema of the tongue, lips, and eyelids 10 hours after insertion of new upper and lower dentures made of the same acrylic material as the old prostheses. Sensitization for acrylic materials may have occurred years earlier and with the new prostheses, allergens in the form of residual monomers triggered an allergic reaction. The release of acrylic monomers is highest when a prosthesis is new and gradually decreases over time. That may explain why the patient tolerated her old prostheses but not the new ones.

In the management of our cataract patient, we primarily searched the literature for reports of allergic reactions to acrylic IOLs. No cases have been reported. One explanation could be that this type of allergy does not exist in the eye. Another explanation could be that the acrylic elastomers are 100% polymerized and unable to elicit an allergic reaction. However, we have been unable to retrieve information from major IOL manufacturers about the contents of monomers and oligomers. Intraocular lenses inserted in the capsular bag without vascular tissue contact may hold a privileged immunological position. On the other hand, some early postoperative inflammatory reactions of unknown origin may actually represent allergic reactions. Theoretically, acrylic monomers present in the newly inserted IOL may be released, reach uveal tissue, and elicit contact allergic reactions in sensitized patients. The allergic reaction will likely disappear following release of all monomers and would be sensitive to our usual antiinflammatory treatment. This might explain some of the extended postinflammatory reactions we experience.

In this case report, the cataract patient had confirmed contact allergy and we selected an IOL without acrylates. This approach may be appropriate in most

![Figure 1. Slitlamp photograph of the silicone IOL at the 6-month follow-up.](image-url)
cases, but in the literature there are no reports of the management of cataract patients with known contact allergy to acrylate. For clinical and legal reasons, we recommend that the surgeon always obtain the manufacturer’s written guaranties for the absence of acrylates in all disposable items and IOLs for patients with known allergy.

A preoperative allergy examination may be warranted in the possible presence of multiple allergies to a variety of IOL materials and in cases of suspected acrylic allergy in silicone-filled eyes. Postoperative assessment is indicated in suspected allergic reactions in a pseudophakic eye with an acrylate IOL. Such patients should be patch tested with a baseline series, MMA, the specific allergens from safety datasheet available, and the IOL material.

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