



Intraocular Acrylic Allergy: Is it Something to Sneeze at?

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ABSTRACT

Cataract surgery is most commonly performed with acrylic intraocular lens (IOL) implantation. To date, there have been no reported cases of intraocular acrylic allergy despite increasing rates of acrylic-induced contact dermatitis elsewhere in the body. Concern regarding acrylate sensitization is gaining traction in the ophthalmology community. This commentary explores the lack of intraocular atopy and whether an acrylic allergy necessitates extensive preoperative consideration.

Keywords: Acrylates; Acrylic; Biocompatibility; Contact dermatitis; Intraocular lens; Patch testing

Key Summary Points

Acrylic intraocular lenses (IOL) are the most commonly utilized material in phacoemulsive cataract surgery with no reports of intraocular acrylic sensitization.

As a result of the increasing prevalence of acrylic allergies, the question arises whether acrylic IOLs will continue to be well tolerated.

In patients who are highly concerned, patch testing and non-acrylic IOL options are available, though routine allergy testing is not indicated.

Patients can be reassured that acrylic IOLs continue to be safe as evidence suggests these lenses are biologically inert.

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Intraocular lens (IOL) implantation restores vision by using a synthetic material to replace the clouded native lens. Dr. Harold Ridley pioneered the first IOL placement in 1949 with a poly(methyl methacrylate) (PMMA) lens, which was observed to be biocompatible in war

veterans exposed to ocular shrapnel. At that time, there was concern for post-implantation precipitation [1, 2], prompting Dr. Benedetto Strampelli to preventatively “humanize” the IOL in patients’ earlobes in an effort to minimize intraocular inflammation [3]. Frederick Ridley’s sodium hydroxide sterilization method was universally used starting in 1957 until the US Food and Drug Administration mandated the use of ethylene oxide in 1978 [3]. While IOL sterilization has effectively been achieved in today’s world of cataract surgery, there is now a concern of sensitization to lens implants. Given the rising prevalence of acrylic allergies [4], the question arises whether acrylic IOLs will continue to be well tolerated.

Acrylics are a notorious allergen elsewhere in the body, causing a delayed type IV hypersensitivity reaction to the monomer and oligomers. Acrylates, (meth)acrylates, and cyanoacrylates polymerize into synthetic thermoplastic resins ubiquitous in medical devices, dentistry, and the beauty and printing industries. Over the past decade, acrylic monomers have been shown to cause sensitization and allergic contact dermatitis in both occupational and non-occupational settings [5]. The first report of an acrylic allergy was by Stevenson in 1941 [6]. Since then, there have been numerous cases of methyl (meth)acrylate (MMA) allergies from various sources [7–11], including electrocardiogram hydrogel and artificial nails [12]. Although the prevalence of acrylic allergy in the general population is unknown, one study observed a prevalence of 1.0–1.4% in a patch-tested population in Sweden and Singapore [13]. Despite minimal understanding of an exact sensitization rate, (meth)acrylates were named “contact allergen of the year” by the American Contact Dermatitis Society in 2012 and have since earned a spot in the baseline series of allergy testing [14].

For patients with suspected acrylic allergy, patch testing is traditionally performed by applying adhesive allergen patches to the upper back and assessing subsequent skin reaction [15]. Some of the most commonly utilized acrylic allergens with documented high reactivity are 2-hydroxymethylmethacrylate (2-HEMA) (0.7%), MMA (0.4%), ethylene glycol

dimethacrylate (EGDMA) (0.4%) [16], and acrylic acid (1% and 0.1% petroleum) [17].

Despite the growing concern for acrylic allergies, over a million cataract surgeries are performed annually in the USA [18] with no reported allergic reactions to acrylic IOLs, including a large case study of causes of lens explantation [19]. Given that the most commonly used materials for IOL implants are acrylic (PMMA hydrophobic acrylate, and hydrophilic acrylate) [20], one would expect reports of acrylic atopy to occur, especially with the disruption of the blood–aqueous barrier during phacoemulsification. A possible reason for sustained lens biocompatibility is the absence of IOL polymer breakdown into the allergen-inducing monomers during or after lens implantation. Furthermore, the anterior chamber-associated immune deviation phenomenon observes a low rejection rate and minimal use of immunosuppressants after corneal allografts [21–23], supporting ophthalmic immune evasion. Given these reasons, we suspect that acrylic allergy is likely not an ophthalmologic concern regarding cataract surgery lens selection, and routine allergen testing is not indicated.

However, there are some instances where management of patients with a documented acrylic allergy needing IOL implantation may warrant additional evaluation, such as reassurance for legal reasons or patients’ peace of mind. Some ophthalmologists have recommended a tape test in which a sample IOL is taped to the patient’s arm to assess for a localized reaction. This approach does not have scientific basis and is unlikely to yield a positive result. Instead, patch testing as described above is a more appropriate method. Additionally, non-acrylic intraocular lenses may be considered in patients who are persistently hesitant with regards to their acrylic allergy. One report of a patient with a documented MMA allergy tolerated a silicone acrylic-free IOL (KS-3Ai) without any complications [24]. In addition to silicone IOL, other non-acrylic options could include Staar nanoFLEX® Collamer® C4204A or CQ2015A (Monrovia, CA, USA). Although these non-acrylic IOL options are appealing for patients concerned about an acrylic allergy,

there are complications to consider, the most common of which is posterior capsular opacification in silicone IOLs [25].

In summary, acrylates are in a multitude of products in both the consumer and medical setting and comprise a growing portion of allergic contact dermatitis. Patients with a documented acrylic allergy seeking cataract surgery will most likely tolerate the standard of care with acrylic IOL as there is no evidence suggesting need for further allergy testing. Patients should be reassured about the complete lack of documented sensitization to acrylic IOLs. However, patch testing to a broad array of acrylates, as well as a discussion of non-acrylic IOL options, may be pursued in select patients.

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