

IOL Exchange: Principles and Practice

An experienced surgeon discusses the common complications leading to the explantation of a foldable IOL and what ophthalmologists should understand about the procedure.

BY STEPHEN S. LANE, MD

Every day, tens of thousands of patients worldwide undergo IOL implantation. Although the overwhelming majority is performed successfully, IOLs must sometimes be removed and exchanged. Replacement occurs for a number of reasons. The most common are incorrect IOL power calculations, dislocation and decentration of the IOL, optical aberrations, and damage to the lens during the insertion procedure.

EXPLORING THE NEED FOR AN IOL'S REMOVAL

The aforementioned complications arise with nearly every type of foldable IOL, but the frequency, etiology, and symptomatology related to these problems differs significantly from lens style to lens style (Table).¹ The most common reason for removing an IOL, regardless of the type of lens, is an incorrect IOL power. This statistic reflects greatly upon surgeons' ability to accurately predict the proper lens power necessary for any given patient. Devices such as the IOLMaster (Carl Zeiss Meditec, Inc.) and Lenstar LS900 (Haag-Streit AG) have increased the precision of axial length measurements and keratometry, but ophthalmologists must continue to improve upon all of the factors that significantly affect IOL power calculation formulas.

SPECIFIC SYMPTOMS REPORTED BY PATIENTS

Type of Lens

In a 2007 survey by Mamalis et al, single-piece hydrophobic acrylic IOLs with haptics were the most frequently explanted type of IOL (24% of the surveys).¹ The most common symptom experienced by patients was visual loss, followed by visual aberrations/optical phenomena. It is important to note that, at the time of the study, this lens style was the most commonly used, as it is today.

The second most frequently explanted IOL was the multifocal hydrophobic acrylic IOL (23% of the surveys).

The most common symptoms were visual aberrations/optical phenomena, followed by vision loss. The three-piece silicone IOL was removed in 20% of the surveys. The most common symptoms experienced by these patients were visual aberrations/optical phenomena, followed by vision loss. The three-piece hydrophobic acrylic IOL was removed in 19% of the surveys. The most common symptom was vision loss, followed by visual aberrations/optical phenomena.

The single-piece (plate) silicone IOL was removed in 6% of the surveys. The most common symptom experienced by patients was vision loss, followed by visual aberrations/optical phenomena. Finally, the hydrophilic acrylic (hydrogel) IOL, both single- and three-piece, was removed in only 4% of the surveys. The most common symptom experienced by patients was vision loss.

Pain and Discomfort

Fortunately, pain and discomfort are not often reported by patients requiring IOL explantation. Displacement, however, could cause the lens to rub against the delicate structures of the uveal tract, particularly the iris and ciliary bodies. The resultant ocular inflammation could become painful. Additionally, if an IOL becomes malpositioned, it could produce an increase in IOP by causing pupillary block glaucoma.

Glare

The most commonly reported problematic visual aberration is glare, a multifactorial challenge that can arise from a number of sources. Patients may experience glare from the truncated edge of an IOL, a dislocated IOL, or posterior capsular opacification. It is important to determine the exact cause for each individual patient, because the surgeon's ability to treat the true etiology may be limited if he or she initially addresses the wrong one. For example, the removal or exchange of an IOL becomes significantly more difficult technically if the posterior capsule has been opened.

TABLE. COMMON COMPLICATIONS LEADING TO SURGICAL INTERVENTION OR AN IOL EXCHANGE^a

Type of IOL	Complications
Single-piece hydrophobic acrylic	<ul style="list-style-type: none"> • Dislocation/decentration, 36% • Iritis/uveitis-glaucoma-hyphema syndrome, 21%
Multifocal hydrophobic acrylic	<ul style="list-style-type: none"> • Glare/optical aberrations, 68% • Incorrect IOL power, 21%
Three-piece monofocal silicone	<ul style="list-style-type: none"> • Dislocation/decentration, 34% • Incorrect IOL power, 21%
Three-piece hydrophobic acrylic	<ul style="list-style-type: none"> • Incorrect IOL power, 34% • Dislocation/decentration, 31%
Single-piece silicone	<ul style="list-style-type: none"> • Dislocation/decentration, 50% • Calcification/opacification, 38%
^a Data adapted from Mamalis et al. ¹	

A few patients have requested the removal of certain acrylic IOLs for cosmetic reasons such as reflections. These reflections appear as an external flicker, because the front surface of such lenses are nearly flat and take on a mirror-like effect.

THE PRINCIPLES OF EXPLANTATING AN IOL
Preoperative Considerations

After deciding to remove or exchange an IOL, the surgeon must take into account certain factors prior to executing the procedure. What type of IOL is to be removed? What are the characteristics of the lens? Is it a one- or a three-piece IOL? What do the haptics look like? Is there anything about the haptics such as eyelets or kinks that might make it more difficult to remove the lens? Which lens will the ophthalmologist use to replace the problematic IOL, assuming he or she can remove it successfully?

Next, it is necessary to formulate a step-by-step plan in order to have the necessary equipment ready to perform the procedure. At minimum, the surgeon will need a variety of hooks and scissors. Vitrectomy capability is essential, as is the ability to use a bimanual type of system, both for vitrectomy and for irrigation and aspiration. Finally, it is imperative to have prepared an alternate plan in the event of unexpected complications and circumstances such as a broken/absent capsule or dehisced zonules.

Intraoperative Considerations

First, it is critical to ensure that the patient is comfortable, perhaps using a local block anesthetic, until the surgeon is adept at the necessary techniques for an IOL's explantation. These cases can often be time consuming, and the patient's comfort and lack of movement are important. Provided that the IOL is in the bag, the key step in the procedure is to find a space between the lens and the anterior capsule. After locating this opening, which is usually at the haptic-optic junction, the surgeon injects an ophthalmic viscosurgical device, thereby viscodissecting open the lens capsule. In most cases, the anterior capsule does not fuse to the posterior capsule at the haptic-optic junction.

The viscodissection is continued for 360° or until the entire bag has been opened. At this point, the surgeon is usually able to rotate the lens within the bag, thus freeing it from any residual attachments within the lens capsule. The next goal is to prolapse each of the haptics out of the capsule and up into the anterior chamber, which has been filled with an ophthalmic viscosurgical device. With the IOL in the anterior chamber, the surgeon will be able to remove the lens relatively easily.

After successfully moving the lens to the front of the eye, the surgeon has a number of options for the removal process, assuming his or her intention is to explant the IOL through a 3-mm or smaller incision. If the lens is acrylic, the surgeon can refold it inside the eye and bring it out folded or cut it in half and remove each piece separately. If the IOL is a silicone lens, the Dodick technique may be used, in which the lens is nearly bisected with the cut's going three-quarters of the way across its diameter. As a result of the hinge created by cutting the IOL nearly all the way across, the surgeon can then grasp the lens and pull it out of the eye. The lens becomes elongated with each segment's being about 3 mm in diameter, 6 mm in total length, but still connected by the small bridge between the two segments. Because a silicone lens cannot be refolded, it must be cut into pieces, or the entire lens can be removed through an enlarged opening. This decision should be based on the comfort level of the surgeon.

In some cases, the lens has simply moved out of position, and its power does not need to be changed. In lieu of a difficult removal process, it is often easier to fixate the

(Continued on page 36)

(Continued from page 26)

lens to the iris with a modification of a McCannel-type suture or fixation to the sclera. If the surgeon is uncomfortable with this option, certainly another alternative is removing the IOL and replacing it with an ACIOL. Whether or not the surgeon performs a vitrectomy, topical steroids and nonsteroidal anti-inflammatory drugs should be used in the postoperative period in an attempt to minimize the risk of cystoid macular edema. Many surgeons also use triamcinolone acetonide (Triesence; Alcon Laboratories, Inc.) intraoperatively to identify vitreous in the anterior chamber and to minimize postoperative inflammation.

CONCLUSION

Several advances by the ophthalmic industry and surgeons have already reduced the incidence of the problems that lead to an IOL's removal. For example, manufacturers have modified the squared edges of some lens designs to decrease optical aberrations. Recently developed injection devices not only help to increase the uniformity of the incision's size, but they also minimize the potential for damage to the lens. Surgeons, meanwhile, continue to improve their matching of IOL designs with individual patients.

As the number of patients needing cataract surgery after LASIK or other refractive surgery rises, the most important surgical factor is an improvement in the accuracy of lens power calculations. Ophthalmologists must also ensure that the anterior capsulorhexis is intact and that they consistently place the IOL inside the lens capsule, while handling the IOL properly with either an insertion device or a folding forceps. Choosing the best IOL can be challenging. Today's surgeon should assess the specific needs of the patient preoperatively, consider the potential complications associated with each available design, and then perform meticulous surgery to optimize results and minimize complications. ■

The use of nonsteroidal anti-inflammatory drugs for the prevention of cystoid macular edema is an off-label use.

Stephen S. Lane, MD, is medical director of Associated Eye Care in St. Paul, Minnesota, and an adjunct clinical professor for the University of Minnesota in Minneapolis. He acknowledged no financial interest in the product or company mentioned herein. Dr. Lane may be reached at (651) 275-3000; sslane@associatedeyecare.com.



1. Marmalis N, Brubaker J, Davis D, et al. Complications of foldable intraocular lenses requiring explantation or secondary intervention—2007 survey update. *J Cataract Refract Surg.* 2008;34(9):1584-1591.