IOL Selection and Power Calculations in Eyes After Retinal Surgery

Careful planning and exquisite execution are imperative in these cases.

BY STEVEN DEWEY, MD

Few patients are as exceptionally and immediately grateful for successful cataract surgery as the post-vitreoretinal surgery patient. For some of these individuals, cataract surgery is the end of a path that began with an epiretinal membrane or macular hole repair. For others, it is the elimination of a crippling refractive error, often in the double-digit myopic range. Although these surgeries are typically successful, a few precautionary steps will make the procedure and the recovery smoother.

SILICONE OIL

Starting with the most complex situations, silicone oil in the eye presents several issues that translate across the spectrum of these cases. Historically, its presence was quite a challenge when calculating IOL power due to the change in ultrasound velocity associated with the media. Interferometry has simplified the process, allowing for an eye containing silicone oil to be accurately measured with the change of a setting.

The most pertinent questions surrounding silicone oil are whether it will be retained and for how long. Silicone oil's refractive index differs substantially from that of the vitreous, and an IOL loses its effective power as a result. This causes a significant hyperopic shift, which in the short term can be dealt with using contact lenses or even a piggyback IOL. Because the interface with the posterior aspect of the optic is where the power is lost, an IOL with a plano posterior curve will function the same with or without silicone oil in the vitreous.

Unfortunately, no IOLs with a plano posterior curve are currently available in the United States. The best alternative is to calculate the IOL power for the planned retention of the silicone oil. Due to the difficulties of silicone oil's adherence to silicone IOLs, the lens should be a hydrophobic or hydrophilic acrylic. This IOL is placed in the bag. In the case of long-term oil retention, this IOL will have a significantly greater power than the surgeon would expect based on measurements alone.

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If the plan is for short-term retention, or if it is uncertain, then the power of the IOL placed in the bag should be calculated without the silicone oil, and a piggyback IOL should be placed in the sulcus to overcome the anticipated hyperopic shift. The IOL for the bag can be a single piece, but the sulcus lens should be a three-piece IOL of different material to avoid the risk of intralenticular opacification and have a rounded anterior edge to avoid uveal chafing. When placing the sulcus-based piggyback, one should be wary of the inferior iridotomy placed to avoid angle closure associated with the use of the buoyant silicone oil.

WEAKNESS OF THE IOL-ZONULE COMPLEX

The question arises as to the cause of lens instability/zonular laxity observed during cataract surgery in the postvitrectomy patient. Certainly, the underlying pathology of the eye is the most likely source of the problem, but although I have no way to quantify this, I believe

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that zonules diminish during a routine vitrectomy in an analogous fashion to endothelial cells during cataract surgery. Much as the loss of 10% of the remaining endothelial cells can lead to prolonged corneal edema or even decompensation, loss of 10% of the remaining zonules may destabilize the lens-zonule complex. This is not typically a problem, unless the surgeon needs to use the zonules as a point of stability to remove a cataract.

On a related note, are the posterior capsules of the postvitrectomy patient really more fragile, or does it just seem that way? Two factors lend truth to this observation. First, these eyes tend to have denser cataracts, especially compared with the fellow eye. As such, the manipulations to remove the nuclei require more mechanical force, placing the capsule at greater risk. Second, the capsule may have been compromised during the original vitreoretinal surgery. This is particularly likely if a focal or rapidly developing cataract is present.

Surgical planning for these cases should employ the strategy placing the least amount of stress on the zonules and capsule. I strongly recommend a chopping technique in this setting, and I prefer a horizontal chop. A flip approach may also provide low levels of zonular stress, but particularly in cases of large, dense nuclei, the capsulorhexis will need to be larger than desired and then may not serve to capture the optic in the event of posterior capsular compromise.

Although I typically use a single-piece implant in these cases, I do anticipate the need for optic capture in the capsulorhexis in the event the posterior capsule is compromised. Having the appropriate three-piece IOL precalculated and readily available makes the experience less unpleasant. I typically do not change the power for a capture in the capsulorhexis, but I will subtract 0.50 D if true sulcus placement is the result.

SIZING CONSIDERATIONS

Patients with previous retinal surgery offer the opportunity to work on some very large eyes. Although this typically translates into a normal anterior segment with a long axial length, in some cases, the anterior segment is proportionally just as large. A standard IOL will usually work without problems, but reverse optic capture may be necessary to center a three-piece IOL in the bag. In the case of sulcus placement, the overall length of the IOL may not be sufficient to hold the lens in place without the support of the capsulorhexis. An anterior chamber IOL in some cases may not be adequately sized to remain stable in the anterior chamber without additional iris sutures.

OPTICAL CONSIDERATIONS

Aspheric IOLs have shown benefit in improving contrast sensitivity, and postretinal surgery patients are no exception. These individuals have frequently also undergone previous refractive surgery (LASIK or PRK). Radial keratotomy patients are, thankfully, more obvious, but this history can be lost in the rest of the surgical saga. The majority of patients will benefit from the common negative or neutral aspherics. The rare posthyperopic refractive case will benefit from a spherical IOL.

The use of toric IOLs for correcting astigmatism is routine, and these lenses should benefit the postretinal surgery patient. Caution should be employed for patients with an unstable capsular platform. In a more challenging situation, patients with pathologic myopia may have astigmatism due to the tilt of the retina. One must remember that the use of a toric IOL will preclude the use of a rigid contact lens to correct irregular astigmatism.

Accommodating and multifocal IOLs are certainly considerations but, again, with caution. The only accommodating IOL approved in the United States is the silicone Crystalens (Bausch + Lomb). This is obviously a poor choice in patients needing silicone oil to stabilize the retina. Multifocal lenses have a loss of contrast inherent in the design, and patients with preexisting retinal pathology may not be capable of enjoying the benefits of these technologies.

CONCLUSION

The particular challenges presented by patients who previously underwent vitreoretinal surgery make these cases anything but routine. With proper surgical planning and careful execution, these patients will share the "routine" experience of the surgery cataract patients have come to expect. ■

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