Lens Surgery for Glaucoma Patients

Inclusion criteria for lens implantation in eyes with shallow anterior chamber depth and narrow-angle glaucoma.

By Matteo Piovella, MD

Removal of a clear lens is controversial. On one hand, it is an invasive and aggressive procedure, and the potential for complications is significant. On the other hand, it can be advantageous for certain patients with large refractive errors or other ocular pathologies. With the aid of anterior segment optical coherence tomography (OCT) technology, I have successfully performed refractive lens exchange (RLE) with multifocal IOL implantation in patients with narrow angles and shallow anterior chambers. Clear lens surgery lowers the intraocular pressure (IOP) in the operated eye, reducing the potential need for iridectomy and topical glaucoma therapy in these eyes with risk factors for developing narrow-angle glaucoma. Additionally, it lowers the potential societal costs of glaucoma management and the number of challenging cataract cases we will see in the near future.

RATIONALE

Given the insidious side effects of glaucoma and the increased life expectancy of the population today, glaucoma prevention and treatment are more important than ever. Using modern technologies, surgeons can manage their glaucoma patients well. However, glaucoma is tricky not only to diagnose but also to treat, as there is no true standard of care that lowers IOP indefinitely.

It is well known that cataract surgery can lead to a reduction in IOP and a deepening of the anterior chamber. Therefore, in patients with narrow angles and shallow anterior chambers who request refractive surgery, provided they have adequate anterior segment dimensions, I often perform RLE surgery. In addition to improving their refractive status, this procedure serves as a means of delaying or preventing the onset or progression of narrow-angle glaucoma in these patients.

Based on studies I have conducted using OCT to image the anterior segment, I have reconsidered my indications for RLE in eyes with shallow anterior chambers and narrow angles. Whereas before I would hesitate to perform RLE in this population, I now readily undertake the procedure if...
three conditions I have dubbed the three As are met: age over 50 years; anterior chamber depth no less than 2.4 mm; and angle width no less than 15º. With the help of the images provided by anterior chamber OCT and the increasingly minimally invasive surgical techniques associated with RLE, it is now possible to use this procedure as a prophylactic treatment for patients at risk for development or progression of narrow-angle glaucoma.

STUDY

I evaluated the anterior segments of 70 eyes with shallow anterior chambers and narrow angles before and after crystalline lens removal to determine the safety and effectiveness of RLE in this population. The patients’ preoperative parameters are listed in Table 1. One week after surgery, the mean BCVA was 0.89; at 3 years postoperative, the mean BCVA was 0.88 (Figure 1). IOP also decreased after surgery, to a mean of 12.99 mm Hg at 1 week postoperative and 14.94 mm Hg at 3 years postoperative, a total decrease of 5.38% (Figure 2).

Increases in anterior chamber depth and angle opening were also noted. At 1 week postoperative, the mean anterior chamber depth had increased to 3.48 mm; by 3 years, it had increased by 70.18% to 3.71 mm (Figure 3). Likewise, 1 week after surgery the mean width of the angle opening increased to 32.25º and at 3 years to...
This represents a mean 204.36% increase in angle width from preoperative (Figure 4). Figures 5 through 7 depict examples of the changes in anterior chamber depth, angle width, and IOP from pre- to postoperative.

I also compared the pre- and postoperative anterior chamber depth, angle width, and IOP in 16 eyes with an IOP of at least 20 mm Hg that underwent removal of the crystalline lens. Preoperative parameters are listed in Table 2. At 1 week postoperative, the mean BCVA improved to 0.88 and continued to improve up to 0.91 at 2 years after surgery (Figure 8). The anterior chamber depth increased to 3.45 mm at 1 week and 3.58 mm at 2 years postoperative, a 64.97% increase from preoperative (Figure 9). The angle width increased by 283.57% by 2 years after surgery (30.84° at 1 week, 36.9° at 2 years; Figure 10), and the IOP decreased by 19.64% at 2 years (16.69 mm Hg at 1 week, 18.33 mm Hg at 2 years; Figure 11).

**STRATEGY**

The crystalline lens grows approximately 20 µm each year, and each year the risks for glaucoma and cataract development increase. With an inadequate angle open-
ing and a shallow anterior chamber, lens surgery can be challenging. However, I believe that RLE can be performed in patients with narrow angles requesting refractive surgery, provided that the three A’s are met, to avoid the need for iridectomy and the initiation of topical glaucoma therapy.

Performing lens surgery in this population is much easier than in the past, thanks to improved surgical planning with anterior segment OCT and to advanced lens surgery techniques. It is better to execute lens surgery at an earlier stage, as the difficulty of lens extraction increases with the hardness of the nucleus, and the rates of complications and corneal damage also increase.

For lens surgery in an eye with a shallow anterior chamber and narrow angle, I fill the anterior chamber with a dispersive ophthalmic viscosurgical device (OVD) such as Healon V (Abbott Medical Optics, Santa Ana, California) because this creates more space in the anterior chamber (Figure 12), increases pupil size (Figure 13), and does not extrude from the anterior chamber during surgical maneuvers. To improve control of the capsulorhexis (Figure 14), I use also a second, cohesive OVD such as Healon (Abbott Medical Optics Inc.) to create a pillow between the Healon V and the anterior capsule to make forceps movements easier. Before phacoemulsification is performed, I top up the OVD to ensure that the endothelium is well protected.

CONCLUSION

With the proper technology and technique, we can attempt lens surgery in patients with shallow anterior chambers and narrow angles, provided that they are at least 50 years of age, have an anterior chamber depth of no less than 2.4 mm, and angle width of no less than 15º. We can perform uncomplicated surgery, avoid glaucoma therapy for a longer time in these eyes at risk of narrow-angle glaucoma, and even implant new-technology IOLs such as multifocal lenses in this population with great success.

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**TAKE-HOME MESSAGE**

- The results of cataract surgery can deepen the anterior chamber and lead to lower IOP.
- Provided that the three A’s are met, cataract surgery can be performed to avoid the need for iridectomy and topical glaucoma therapy.

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**TABLE 1. PREOPERATIVE PARAMETERS (N=70)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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<tbody>
<tr>
<td>Mean age</td>
<td>69.61 ±10.29 years</td>
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<tr>
<td>Mean preoperative BCVA</td>
<td>0.69 ±0.24</td>
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<tr>
<td>Mean IOP</td>
<td>15.79 ±5.17 mm Hg</td>
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<tr>
<td>Mean anterior chamber depth</td>
<td>2.18 ±0.18 mm</td>
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<tr>
<td>Mean angle width</td>
<td>12.84 ±5.79º</td>
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</tbody>
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**TABLE 2. PREOPERATIVE PARAMETERS IN EYES WITH IOP GREATER THAN OR EQUAL TO 20 MM HG (N=16)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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<tbody>
<tr>
<td>Mean age</td>
<td>69.00 ±10.96 years</td>
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<tr>
<td>Mean preoperative BCVA</td>
<td>0.74 ±0.23</td>
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<tr>
<td>Mean IOP</td>
<td>22.81 ±5.48 mm Hg</td>
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<tr>
<td>Mean anterior chamber depth</td>
<td>2.17 ±0.15 mm</td>
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<tr>
<td>Mean angle width</td>
<td>9.62 ±2.95º</td>
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