Two advanced technologies have set the stage for an innovative surgical approach that allows patients to be less dependent on their glasses and perhaps their glaucoma medications as well.

BY JUSTIN SCHWEITZER, OD

Glaucoma affects more than 2 million people in the United States, and it is believed that number will increase to more than 3 million by 2020 due to the aging of the US population. Cataracts are the leading cause of low vision among white, black, and Hispanic people, accounting for 50% of bilateral visual acuity worse than 20/40. These two conditions often coexist, as they both become more common with age. In our center, at Vance Thompson Vision, there is not a much more exciting procedure performed than laser cataract surgery, which we call refractive laser-assisted cataract surgery or ReLacs, in combination with the insertion of the iStent trabecular micro-bypass stent (Glaukos Corporation) for our patients with cataracts and mild to moderate glaucoma.

Laser Cataract Surgery

The Food and Drug Administration cleared femtosecond laser systems for cataract surgery in 2010, and currently, they are used to create corneal incisions, capsulotomies, astigmatic relaxing incisions, and for fragmentation of the lens. Cataract surgeons are faced with high expectations for refractive outcomes, and the goal is to achieve results as close to the intended target as possible.

A well-centered and perfect capsulorhexis is more important than ever in achieving an outcome of emmetropia. It is especially important because of the increasing use of accommodative and multifocal IOLs. These premium IOLs are pupil dependent and can be affected by a decentered or imperfect capsulorhexis. Nagy et al conducted a study to compare femtosecond laser-created capsulorhexes with manually created capsulorhexes. The study results showed better IOL centration in the femtosecond laser group compared to the manual capsulorhexis group, and it also showed that...
there was a higher rate of IOL decentration when there was an irregularity of the capsulorhexis’ shape. The performance of premium IOLs, and diffractive lenses in particular, can also be affected by decreased contrast sensitivity. In glaucomatous eyes, studies have shown that an increase in visual field loss correlates with a decrease in contrast sensitivity. Patients with visual field loss, and thus decreased contrast sensitivity, are not good candidates for diffractive premium IOLs; they are better suited for a monofocal IOL or an accommodating IOL.

The ability to create accurate limbal relaxing incisions (LRIs) is another advantage of cataract laser systems. The machine can perform corneal or LRIs to correct up to 3.50 D of astigmatism (but are commonly used to correct up to 2.00 D) and minimize the inconsistencies of depth, axis, arc length, and optical zone seen with manual LRIs (Figure 1).

Corneal endothelial damage, corneal edema, and anterior chamber inflammation are a concern with cataract surgery in patients with certain conditions such as Fuchs dystrophy and glaucoma. Using the femtosecond laser, surgeons can divide the lens nucleus with low-energy pulses without the need to enter the eye, reducing the energy needed in the phacoemulsification procedure. Nagy et al reported day-1 postoperative data from nine patients showing mild corneal edema, trace cell and flare, and no eyes having an intraocular pressure (IOP) greater than 21 mm Hg at any time.

**TRABECULAR MICRO-BYPASS STENT**

In 2012, the iStent was approved by the Food and Drug Administration for use in conjunction with cataract surgery. It is the smallest Food and Drug Administration-approved medical device known to be implanted in the human body. The stent was designed to serve as a bypass through the trabecular meshwork to facilitate physiological outflow and, thus, lower IOP. The iStent, on the tip of an inserter, is placed in the eye through the same clear corneal incision used during cataract surgery. It is then implanted through the trabecular meshwork and into Schlemm canal with the assistance of a gonioprism (Figure 2).

The implantation of the iStent at the same time as cataract surgery has a better safety profile compared with traditional filtration surgeries in combination with cataract surgery. Samuelson et al demonstrated that the device plus cataract surgery achieved no compromise in visual outcomes or safety of the cataract surgery procedure. Patients who undergo traditional filtration surgeries are at risk for complications such as bleb leaks, bleb infections, or hypotony, which are not a concern for patients implanted with the iStent.

**COMBINED SURGERY**

The advanced technologies of laser cataract surgery and the iStent have set the stage for an innovative surgical approach that allows patients to be less dependent on their glasses after cataract surgery and targets mild to moderate glaucoma all in one surgery. Cataract surgery alone has been shown to reduce IOP in patients with mild to moderate glaucoma. Poley et al conducted a study of 588 eyes to evaluate the long-term effects of cataract extraction in normotensive and ocular hypertensive eyes. Patients who had the highest presurgical IOPs obtained the greatest reductions after cataract extraction at 1 year.

Is it possible to lower the IOP to an even greater extent in patients with mild to moderate glaucoma and coexisting cataracts without simply adding more medications? A few millimeters of mercury in IOP reduction can make all the difference in slowing down or stopping progressive glaucoma. The iStent in conjunction with cataract surgery has been shown to reduce IOP on fewer medications versus cataract surgery alone.

Samuelson et al revealed a few key points about cataract surgery plus iStent insertion versus cataract
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surgery alone. The first important finding in the study was that a 20% reduction in IOP without medication was achieved in 66% of eyes treated with cataract surgery plus an iStent versus 48% of eyes treated with cataract surgery alone. A second takeaway point from this study is that twice as many patients in the cataract surgery-only group went back on medications at 1 year compared with patients in the cataract surgery-plus-iStent group.

Similar to the Samuelson study, Fea conducted a study that showed the advantages of a combined procedure (cataract plus iStent) versus cataract surgery alone. The combined group in the Fea study had an additional 3 mm Hg of IOP reduction compared with the cataract surgery-alone group. Throughout the study, more patients who had the combined procedure remained medication free in comparison to the cataract surgery-alone group. Patients’ noncompliance with glaucoma medications is an ongoing concern for eye care providers. The more complex a glaucoma dosing regimen is, the more likely a patient will be noncompliant. Cataract surgery plus iStent implantation has shown it is possible to decrease how many glaucoma medications a patient is on, thus making their compliance more likely.

Significant IOP reduction in combination with cataract surgery is possible, and yet another advantage of the iStent in combination with laser cataract surgery is that the refractive predictability is similar to cataract surgery alone. The pairing of laser cataract surgery and the device allows for an accurate refractive outcome in combination with a powerful glaucoma surgery. This is not the case with a majority of other combination cataract and glaucoma surgeries involving filtration. Trabeculectomy has been shown to induce corneal curvature changes, adversely affecting postoperative visual acuity. Due to these corneal changes, it is difficult to predict the refractive outcome with the combination of trabeculectomy and cataract surgery.

CONCLUSION

As the incidence of glaucoma and cataract increase with the advancing age of the US population, patients will continue to explore and seek out new options to achieve better refractive outcomes and reduce the use of medications. In our center, we have patients with mild to moderate glaucoma who are seeking a solution that decreases their dependence on glasses and glaucoma medication usage. We now have a technology in laser cataract surgery, what we call ReLacs, to remove their cataracts, which will help lower their IOP and make them less dependent on spectacles. In conjunction with laser cataract surgery, the insertion of an iStent will allow for further IOP reduction, possibly reducing the burden of their medication usage. These types of patients are some of the happiest that come through our clinic on a daily basis.

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