Combined Procedures for Beginners

It is best to start with the easiest procedures.

BY GABOR B. SCHARIOTH, MD, PhD

Not only is phacoemulsification with subsequent IOL implantation the most common surgery performed today, but it is perhaps also currently the most standardized and uncomplicated surgical intervention. In Germany, it is estimated that more than 600,000 cataract surgeries are performed annually. The surgical time, in almost all cases, is less than 10 to 15 minutes.

Over the past few decades, cataract surgery evolved from simple removal of an opaque lens through a large incision (11 to 12 mm), leaving the eye aphakic, to a customized procedure boasting a 2-mm incision size and implantation of any number of advanced-technology IOLs. Today, I routinely consider the refractive aspects of cataract surgery. In addition to choosing which IOL to implant and where to put the main incision, I decide if I should combine phacoemulsification with additional refractive interventions such as antiastigmatic incisions, a corneal laser refractive procedure (biopics), or an add-on IOL (multifocal or toric) to improve the refractive outcome. Therefore, almost all of my cataract surgeries have become combined cataract and refractive procedures.

More complicated cases may require an additional procedure, such as synechiolysis with or without dilatation, pupil reconstruction with sutures or iris implant, stabilization of the capsular bag with a capsular tension ring, or capsular bag refixation using a Cionni Capsular Tension Ring for suture fixation (Morcher GmbH, Stuttgart, Germany), before safely completing cataract surgery. Such cases are a good segue into combined procedures, and so I started early in my career to perform cataract surgery in combination with glaucoma or vitreoretinal surgery.
**GENERAL CONSIDERATIONS**

Today, I treat many patients with coexisting cataract and glaucoma or vitreoretinal disease. In each case, my first consideration is whether a combined procedure or a stepwise approach is best indicated. Generally speaking, this decision is based on the surgeon’s preferences and the patient’s wishes. For me, a major advantage of combined procedures is reduced chair time and less need for repeated patient visits. Combination surgery is not only cost effective from the doctor’s and insurers’ points of view, but also, if hospitalization is required, the patient who undergoes combined surgery will be admitted only once.

For the patient, a combined procedure translates to less cumulative surgical time, as preparation for surgery, disinfection, draping, and other surgical steps are performed only once. Additionally, in most cases the patient needs to come for surgery only once per eye if a combined technique is used to treat concomitant diseases in both eyes. Otherwise the patient would be undergoing four surgeries, even in cases with uncomplicated intra- and postoperative courses. Combined techniques are also beneficial because anesthesia is needed less frequently and final visual recovery is faster than in stepped surgery. Today, postoperative care does not differ much between phacoemulsification alone and phacoemulsification combined with modern glaucoma or vitreoretinal surgery.

Reduction or elimination of antiglaucomatous medications is also important for patients and for the health care system. Therapy with modern antiglaucomatous eye drops easily exceeds €50 per month, and in case of combination therapy a price tag of more than €100 per month is not uncommon. This adds up to more than €1,000 every year for glaucoma therapy alone.

When undertaking a new surgical technique, I suggest that the cataract surgeon first perform the solitary procedure in pseudophakic eyes. After the learning curve and once the surgeon is familiar with the technique, he or she can proceed by performing this new procedure in combination with phacoemulsification. Almost all surgical approaches can be safely combined with phacoemulsification in the case of a coexisting cataract and without increasing the risk for complications compared with separate surgeries.

**CATARACT AND GLAUCOMA**

In the past four decades, trabeculectomy has become the standard of care in glaucoma surgery. Today, almost all trabeculectomies are performed with intraoperative use of antimetabolites; however, as shown by the Advanced Glaucoma Intervention Study (AGIS), the trabeculectomy procedure itself induces cataract in up to 80% of phakic eyes. Luckily, the frequency with which we perform trabeculectomy has been reduced worldwide due to a number of potent new antiglaucomatous drugs and the trend toward primary cataract surgery in eyes with open-angle glaucoma.

The intraocular pressure (IOP)-lowering effect of phacoemulsification is on average 2 to 3 mm Hg, and in some eyes the effect is much greater. Unfortunately, we do not know which eyes will respond in this way, and many glaucoma patients treated with phacoemulsification alone are later considered for glaucoma surgery as their IOP continues to rise in the years following surgery. In my practice, patients referred for glaucoma surgery increasingly experience side effects associated with use of modern antiglaucomatous drugs, and this has become one of the major indications to perform glaucoma surgery.

One option for treatment of concurrent cataract and glaucoma is phacotrabeculectomy. However, many surgeons hesitate to adopt this combined procedure because of possible postoperative complications. This approach can be simplified by implanting the Ex-Press Shunt (Alcon Laboratories, Inc. Fort Worth, Texas) under the scleral flap. There is no need for peripheral iridectomy, and there is a much lower incidence of postoperative complications.
complications such as flat anterior chamber, choroidal detachment, and hyphema.

There is also a strong trend among anterior segment surgeons toward less invasive and more controlled glaucoma surgery. Since their introduction, deep sclerectomy and viscocanalostomy, two nonpenetrating glaucoma surgery techniques, have been used in combination with phacoemulsification. (Editor’s Note: For more information on deep sclerotomy, see High-Frequency Deep Sclerotomy, page 68.) Canaloplasty is the newest approach for open-angle glaucoma surgery and may produce even better results when used in combination with phacoemulsification than when performed alone.\(^3\)

I was trained in viscocanalostomy, and in my early career it was my favorite glaucoma surgery. Once I started performing canaloplasty in 2006, however, I changed my surgical preferences. Now I also combine canaloplasty with phacoemulsification. For this I create a shared incision, performing phacoemulsification under the superficial scleral flap and the canaloplasty with the help of the Glaucolight (DORC, Zuidland, Netherlands). Perforation of a Descemet window with iris prolapse is the principal complication of this technique, and it necessitates iridectomy and conversion to trabeculectomy. When this occurs, I fill the anterior chamber with air at the end of the surgery and suture the superficial scleral flap more loosely than I would for canaloplasty. As the postoperative care after nonpenetrating glaucoma surgery is uncomplicated in most eyes and the standard postoperative therapy does not differ much from therapy after cataract surgery, I consider use of this approach in patients with concomitant cataract and glaucoma (Figure 1).

One major advantage of nonpenetrating glaucoma surgery is that the integrity of the anterior chamber is preserved during and after surgery, as a flat anterior chamber is the main cause for postoperative complications in penetrating procedures. Additionally, a peripheral iridectomy is not required. Over the past few years, I have performed phacoemulsification in combination with minimally invasive glaucoma surgery (MIGS) techniques such as trabecular bypass surgery with the iStent (Glaukos Corp., Laguna Hills, California) and the Hydrus (Ivantis, Inc., Irvine, California). This surgery seems to be easy, but in fact it poses some challenges. First, I had to become familiar with the use of a gonioprism (a glass lens designed to provide direct views of the angle) and to operate with the microscope and the patient’s head tilted 40°. Despite some early evidence, the IOP-lowering effect of combined phaco-MIGS over phacoemulsification alone must still be demonstrated in larger studies. However, I consider performing combined phaco-MIGS in patients with mild to moderate glaucoma and coexisting cataract who are not willing to undergo phacocanaloplasty and who do not have very high preoperative IOP on maximally tolerated medical therapy.

I perform more than 1,000 phacoemulsifications and more than 150 glaucoma procedures per year. About 50% of my glaucoma procedures are combined surgeries, and every year I see a slight increase in the number of patients referred for glaucoma surgery. I believe every anterior segment surgeon should incorporate some of the new glaucoma surgeries into his or her armamentarium.

**TAKE-HOME MESSAGE**

- Before each case, the first consideration is whether a combined procedure or a stepwise approach is best indicated.
- After a learning curve, most any procedure can be combined with phacoemulsification in patients with concomitant cataract without increasing the risk for complications compared with two separate surgeries.
- Phacoemulsification by itself can lower IOP 2 to 3 mm Hg, and in some cases it can be combined with glaucoma surgery for additional IOP reduction.
- Phacoemulsification combined with vitreoretinal surgery provides a better view of the fundus and better access to the vitreous base.
- Cataract formation after vitreoretinal surgery occurs in up to 80% of patients within 2 years after surgery.

**CATARACT AND VITREORETINAL SURGERY**

When I was trained in vitreoretinal surgery 15 years ago, it was standard to perform 20-gauge vitrectomy. In that era, the surgical time even for vitrectomy in eyes with epiretinal gliosis or macular hole was rarely less than 1 hour, and very often eyes showed increased postoperative inflammation. At that same time, a scleral tunnel incision with implantation of a rigid PMMA IOL was the standard of care for cataract surgery. Most surgeons were trained either in cataract surgery or vitreoretinal surgery and were instructed to separate the two whenever possible.

With the adoption of small and microincision cataract surgery (MICS) and foldable posterior chamber IOLs, these rules began to change, and I started to perform more combined surgeries. There was no longer a need to suture the main incision to avoid anterior chamber collapse and iris prolapse. The use of sutureless incisions also reduced the incidence of induced astigmatism. During this time, the main advantage of combined phacoemulsification and vitreoretinal surgery became clearer: It provided a better view of the fundus and better access to the vitreous base. We also noticed that surgery was more controlled, vitreous shaving was easier, and postoperative endotamponade was more effective.
When Fujii and colleagues introduced microincision transconjunctival 25-gauge vitrectomy, I promptly adopted this technique, and since 2004 it has been my standard approach for vitreoretinal surgery. I started with simple cases, such as eyes with vitreous opacities or simple vitreous hemorrhage. Combination of this approach with small-incision cataract surgery was obvious for me. I then began to use 25-gauge vitrectomy for macular surgery, and today I perform almost all of my cases—even the most complicated situations with severe proliferative diabetic retinopathy or retinal detachment with proliferative vitreoretinopathy formation—using a 25-gauge technique. For a period in early 2000, I used a biaxial phacoemulsification technique, and the combination with microincision vitreoretinal surgery (MIVS) was exciting. But, because no IOL fits through a 1.4-mm incision, I returned to coaxial phacoemulsification for routine cases.

For beginners, 23-gauge vitrectomy may be more convenient; however, today it has no advantage over 25-gauge surgery. Since the introduction of 27-gauge transconjunctival vitrectomy, I think 25-gauge is the best gauge surgery. Since the introduction of 27-gauge vitrectomy, I think 25-gauge is the best of both worlds; it is my gold standard.

In 2010, I performed more than 500 vitreoretinal surgeries, about 20% of which were combined surgeries. I tend to avoid removal of the crystalline lens in patients younger than 50 years to preserve accommodation. In most other patients, I combine vitreoretinal surgery with phacoemulsification and IOL implantation for a couple of reasons:

- Cataract formation occurs in up to 80% of patients within 2 years after vitreoretinal surgery, and if the vitreous base must be shaved intraoperatively or if peripheral retinotomy is required, even in the hands of an experienced surgeon, the risk of lens touch or damage is relatively high.

One exception to this is in phakic eyes with need for silicone oil tamponade. In these cases, I leave the crystalline lens untouched during primary vitreoretinal surgery. As a secondary procedure, I then perform phacoemulsification, posterior capsulorrhexis, silicone oil removal through the anterior segment, and IOL implantation with optic capture. If there is no need for retinal reintervention in these eyes, this approach is much faster and leaves the conjunctiva untouched.

Years ago, at the end of combined procedures, I performed a capsulectomy with the vitreous cutter to prevent the need for later reintervention (ie, Nd:YAG capsulotomy) and potential complications (eg, IOL damage, IOP rise, floaters). However, I found that capsulectomy was less well controlled during primary surgery than in fibroed capsules in pseudophakic eyes. Also, if fluid-air exchange was needed, the fundus view could be compromised due to condensation on the IOL surface.

**DROPPED NUCLEUS**

For anterior segment surgeries, one of the most devastating complications of cataract surgery is a dropped nucleus. Today, many techniques are available to address this situation. For instance, I perform 25-gauge MIVS with removal of the posterior hyaloid. I inject heavy fluid under the lens and/or lens fragment to lift it up and support it behind the iris (Figure 2). I then plug the trocar/cannulas and perform phacoemulsification through the clear corneal incision. The heavy fluid is removed, and, depending on the status of the capsule, the IOL is implanted in the bag or sulcus or is fixated to the sclera. This approach is much faster and safer than endophacoemulsification and does not require opening the conjunctiva. Before attempting this procedure, it is best to acquire some experience in vitreoretinal surgery, as peripheral retinal breaks are not uncommon and must be treated intraoperatively. Also, the view of the fundus can be compromised due to prolonged and difficult cataract surgery, resulting in corneal edema and folds in Descemet membrane.

**CONCLUSION**

The border between anterior and posterior segment surgery is becoming more transparent. Some of the techniques described above are best performed by surgeons who are familiar with both anterior and posterior segment surgery. All that is required to achieve this is a willingness to learn and to endure the learning curve. I have found that I am able to provide these services to my patients, and in the process I have become more relaxed in difficult situations.

Gabor B. Scharioth, MD, PhD, is in private practice at the Aurelios Augenzentrum in Recklinghausen, Germany. Dr. Scharioth states that he is a consultant to DORC International and Ivantis Inc. He may be reached at tel: +49 2361306970; email: gaborscharioth@augenzentrum.org.