Phacoemulsification and Pars Plana Vitrectomy

To combine or not to combine?

BY ARTURO ALEZZANDRINI, MD; AND J. FERNANDO AREVALO, MD, FACS

Cataract and vitreoretinal diseases often occur simultaneously. Progress in surgical techniques for cataract extraction and improvements in IOL technology have increased the indications for cataract surgery. Additionally, pars plana vitrectomy (PPV) is now performed for a variety of vitreoretinal diseases. Cataract extraction may be combined with PPV if the opacified lens interferes with the surgeon's view of the retina, hindering the operation. Even if the cataract is not significant at the time of vitrectomy, it can progress at a reported rate of 68% to 80% by 2 years after surgery and may progress more rapidly in diabetic patients.[1-4] Other predisposing factors for cataract formation may include patient age, preexisting nuclear sclerosis, lens injury during PPV, and the use of intravitreal gas or silicone oil.[5-7]

The surgical management of patients with vitreoretinal diseases and cataract has always represented a significant problem for vitreoretinal surgeons. The major difficulty is not only visual interference created by lens opacification, but also determining on a patient-by-patient basis whether phacoemulsification and PPV should be combined or approached as a two-step procedure.

COMMON APPROACHES

Methods for cataract removal include lensectomy, extracapsular cataract extraction, and phacoemulsification. Phacoemulsification has many advantages over other cataract surgical procedures because it is associated with quick visual recovery and less postoperative inflammation.[8,9] The procedures to remove the cataract and repair posterior segment disease can be performed either as a sequential two-step procedure in subsequent sessions—posterior segment surgery followed by removal of the lens—or combined cataract and vitreoretinal surgery.[10] Cataract surgery in the vitrectomized eye has been reported to present challenges, which include the loss of vitreous support, unstable posterior capsule, weakened zonules, and posterior capsular plaque.[11,12,16]

It is widely accepted today that the most effective procedure for lens extraction is sutureless clear corneal pha-

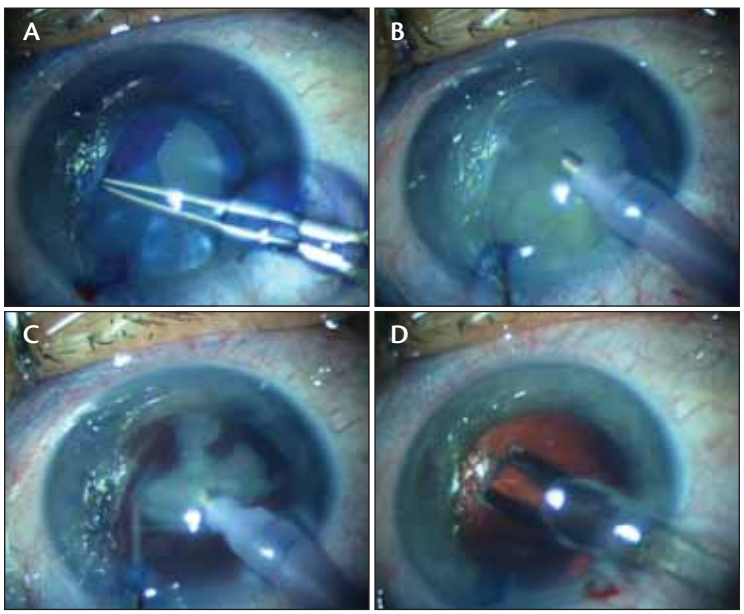

Figure 1. Phacoemulsification and IOL implantation. (A) Anterior capsulorrhexis with trypan blue. (B) Phacoemulsification. (C) Automatic aspiration. (D) IOL implantation.

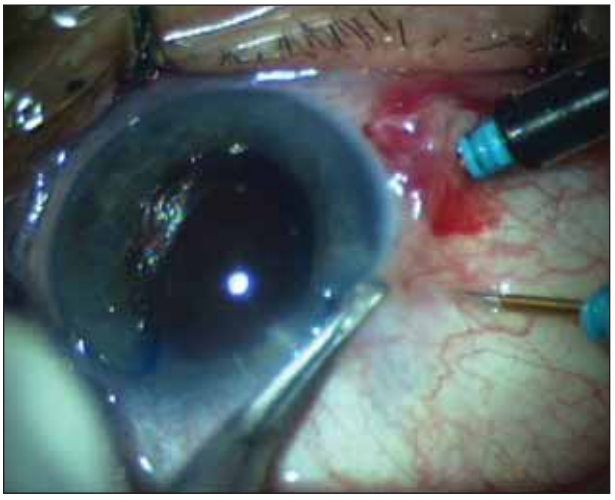

Figure 2. After clear corneal phacoemulsification and IOL implantation, place a prophylactic 10-0 nylon suture to avoid anterior chamber collapse, decompression, and iris prolapse. It is recommended to leave viscoelastic in the anterior chamber during the vitrectomy procedure to maintain anterior chamber depth. Commence minimally invasive vitreoretinal surgery by positioning 25-gauge sutureless trocars and cannulas.

coemulsification. The common approach for PPV is transconjunctival small incision (23- or 25-gauge) sutureless vitrectomy, also known as minimally invasive vitreoretinal surgery (MIVS).[13,14]

If a patient has a cataract and the opacified lens interferes with the surgeon's view of the retina and hinders the operation, combination phacoemulsification and vitrectomy is indicated (Table 1). However, if the cataract allows for good visualization of the posterior pole, we must decide on the best approach: (1) a combined procedure, clear cornea phacoemulsification and then PPV, both performed at the same surgical session, or (2) a two-step procedure, PPV is performed first, and then clear cornea phacoemulsification performed as a secondary procedure during a second surgical session.

COMBINED PROCEDURE

A combined approach with MIVS has been rising in popularity among vitreoretinal surgeons, mainly because it has several advantages when compared with the two-step procedure. These include faster visual acuity recovery (which expedites patient satisfaction), no suture-related astigmatism, less postoperative inflammation, less conjunctival fibrosis, easier vitreous shaving, better access to the vitreous base, and more effective postoperative tamponade (Table 2).

There are three ways to start this procedure. One option is to introduce the vitrectomy transconjunctival trocars, then perform phacoemulsification, complete the vitrectomy via pars plana, and leave IOL implantation as the last step once all intraocular problems have been resolved.

A second option is to start by performing phacoemulsification and, once this is completed, introduce the vitrectomy transconjunctival trocars. Perform the vitrectomy via pars plana and, once again, leave IOL implantation for the last step.

A third option is to perform clear corneal phacoemulsification with IOL implantation first, and then perform MIVS. After clear corneal phacoemulsification and IOL implantation, a prophylactic 10-0 nylon suture is placed to avoid anterior chamber collapse, decompression, and iris prolapse. It is recommended to leave viscoelastic in the anterior chamber during the vitrectomy procedure to maintain anterior chamber depth (Figures 1 to 6).

Based on our experience, we recommend performing corneal self-sealing small incision rather than a scleral incision. Corneal incisions offer several advantages, including less endothelial cell damage, leading to a significant reduction in postoperative corneal edema. This method results in fewer incidences of endothelial folds and outflow through the incision.

Small-gauge techniques. When it comes to performing PPV, we prefer 23- or 25-gauge vitreoretinal techniques for the following reasons:

- Both 23- and 25-gauge techniques are comparable in simplicity, velocity, and potential complications;
- The transition to 23-gauge is simpler than to 25-gauge because the instruments have a rigidity similar to 20-gauge instruments and manipulating the globe is easier. We have also found vitreous removal to be similar to 20-gauge techniques;

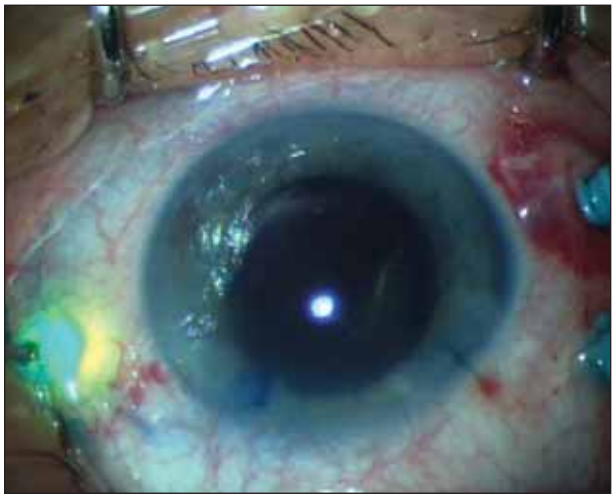

Figure 3. The IOL is implanted during 25-gauge combined vitrectomy surgery. The 25-gauge instrumentation is in place to start the posterior part of the surgery.

TABLE 1. INDICATIONS FOR PHACOEMULSIFICATION AND PARS PLANA VITRECTOMY

- Advanced cataract that precludes visualization
- Retinal detachment with or without proliferative vitreoretinopathy
- Diabetic retinopathy
- Macular hole
- Epiretinal membrane
- Ocular trauma

TABLE 2. ADVANTAGES OF COMBINED SURGERY AND MIVS

- Faster visual acuity recovery
- No suture-related astigmatism
- Less postoperative inflammation
- Reduced conjunctival fibrosis
- Easier vitreous shaving
- Better access to vitreous base
- Most effective postoperative tamponade

• MIVS is the most widely used and recommended technique among vitreoretinal surgeons today;

• As an evolving technique, the range of instruments has expanded significantly, allowing better management of complex cases;

• Complications that have been described following 23- or 20-gauge vitrectomy, such as endophthalmitis and hypotony, can be avoided by constructing adequate wounds, using subconjunctival antibiotics, and performing a fluid-air exchange at the end of the procedure; and

• Wound construction will be further simplified with newer trocars.

TWO-STEP PROCEDURE

Difficulties and challenges involved in sequential surgery include an extremely deep anterior chamber during phacoemulsification, zonular dehiscence, increased mobility of the posterior capsule, and loss of nuclear fragments posteriorly; these have been reported to be caused by a decrease in vitreous support. Additionally, cataract surgery in patients who had previously undergone PPV implies a longer recovery time, two local or general anesthesias, and frequently inaccurate biometry. Cataract surgery in diabetic patients can also lead to a worsening of diabetic retinopathy.[15]

Although total intraoperative time is shorter for a two-step procedure compared with a combined approach, we have found that patients who undergo sequential surgeries experience increasing discomfort. Also, visual acuity recovery takes longer and postoperative inflammation is greater with this technique. Another disadvantage is cost; two surgeries cost more than the combined procedure.

COMPLICATIONS

Postsurgical complications are similar in both procedures. In the two-step procedure, we have to keep in mind that we will be facing complications associated with pha-

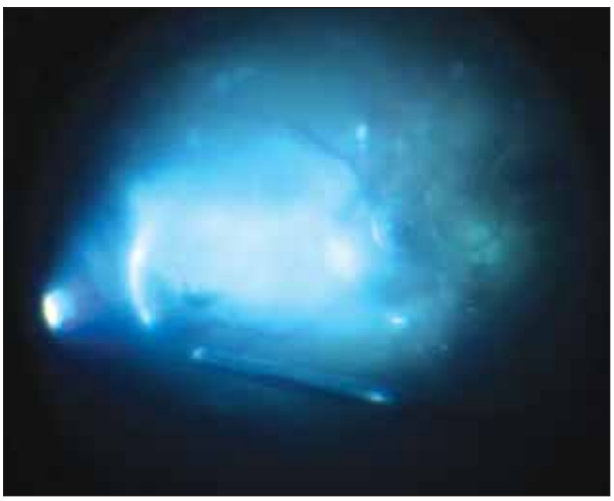

Figure 4. Intraoperative surgical photograph of a uveitic eye treated with 25-gauge instrumentation and perfluorocarbon liquids.

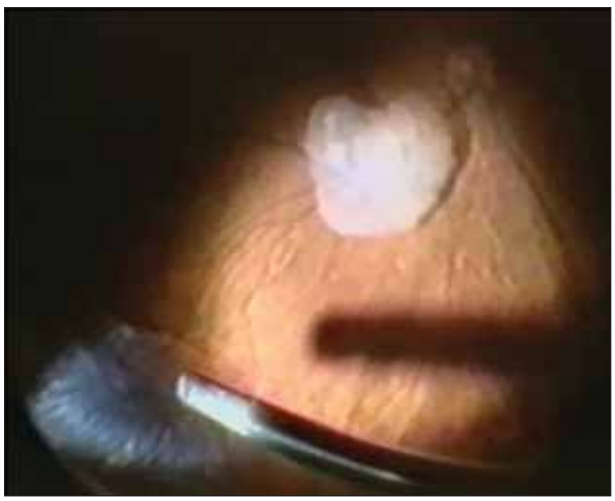

Figure 5. Intraoperative surgical photograph of lens fragments in the posterior pole treated with 25-gauge instrumentation.

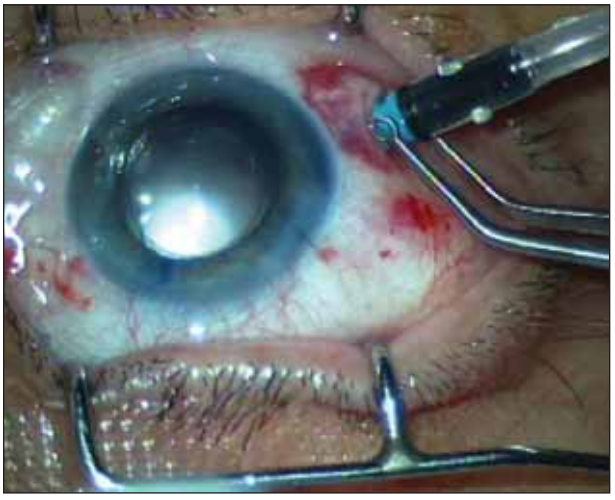

Figure 6. At the end of the procedure, 25-gauge cannulas are removed and a cotton tip is used to misalign conjunctival and scleral orifices. Additionally, subconjunctival antibiotics and fluid-air exchange at the end of the procedure are recommended.

coemulsification and PPV, just as in the combined procedure, but during separate surgical sessions.[17]

The most common intraoperative complications associated with phacoemulsification include tears during anterior capsulorrhexis, rupture of the posterior capsule with the phaco tip, and dislocation of nuclear fragments to the vitreous cavity.

PPV-associated complications include suprachoroidal infusion, bending and breakage of the vitrectomy and endoilluminator probes (25-gauge), inadvertent removal of the trocars, and vitreous incarceration in the sclerotomies. Some of these complications, as well as postoperative hypotony and the risk of endophthalmitis, can be avoided with careful incision construction and fluid-air exchange at the end of the case.

FINAL CONSIDERATIONS

In summary, there are advantages and disadvantages to each approach, but both are safe and effective. However, we favor combined surgery because it requires a shorter postoperative recovery time, anterior vitreous structures can be removed without risk of touching the lens, visualization of the posterior pole is good during vitrectomy, and it involves only one surgical session, which may reduce patient discomfort and decrease risks and costs. Also, patients with retinal vascular diseases frequently undergo panretinal photocoagulation during the operation, decreasing the risk of developing retinal and iris neovascularization.

However, there are potential disadvantages to combined surgery, such as increased operating time and stress on the surgeon, difficulty visualizing the capsulorrhexis because of an absent or reduced red reflex, cataract wound dehiscence caused by globe manipulation during subsequent vitreous surgery, and intraoperative miosis after cataract extraction. Other disadvantages include bleeding from anterior structures, loss of corneal transparency from corneal edema and Descemet's folds, inadvertent exchange of anterior segment fluids with posterior segment tamponading agents, IOL decentration and iris capture in eyes with gas-air or silicone oil tamponade, and prismatic effects and undesirable light reflexes during vitreoretinal surgery caused by IOL implantation before posterior segment procedures. ■

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