Combined Procedures

The simultaneous management of cataract and glaucoma.

BY BRADFORD J. SHINGLETON, MD

Cataract and glaucoma commonly coexist and present special problems for the ophthalmologist. The risks and rate of complications of cataract surgery are greater in glaucomatous than nonglaucomatous eyes due to miotic pupils, posterior synechiae, peripheral anterior synechiae, the presence of preexisting blebs, and pseudoexfoliation. The lack of consensus as to the best surgical approaches for coexisting cataract and glaucoma is therefore not surprising. Should ophthalmologists perform combined cataract and glaucoma surgery or separate the procedures? If the latter, should phacoemulsification precede glaucoma surgery or vice versa? If combined surgery is a superior option, is one site or two preferable?

The development of nonfiltering surgeries for IOP control increases the number of glaucoma procedures that can be performed in tandem with cataract surgery. The timing and long-term outcomes of cataract surgery in the setting of glaucoma also remain controversial. This article assesses the benefits and drawbacks of combined cataract and glaucoma surgery, its indications, and its performance.

PROS AND CONS

Among its advantages, combined cataract and glaucoma surgery involves a single trip to the OR and restores patients' vision relatively promptly compared with separate procedures. Compared with cataract surgery alone, patients often require fewer glaucoma medications after combined surgery, and early and long-term postoperative IOP control is often better.[1] In addition, surgeons can administer antimetabolites to enhance the probability of lower IOP postoperatively. Finally, removing the cataract facilitates their assessment of the optic nerve and visual fields.

Unfortunately, combined surgery is associated with more postoperative complications than cataract surgery alone. The problems of a shallow anterior chamber, bleb leak, choroidal effusion and/or hemorrhage, hypotony, infection, dellen, and astigmatism can all be more serious as well. Compared with cataract surgery alone, a combined procedure is more time consuming and is associated with more intense requirements for postoperative care.

INDICATIONS

There are no rigid standards for when combined cataract surgery should be performed, and one cannot be dogmatic about the indications for this approach. Because combined procedures result in better IOP control and reduced requirements for glaucoma medication than phacoemulsification alone, I favor a combined procedure when patients require more than two medicines for satisfactory IOP control. I am similarly inclined if their use of medication is lim-

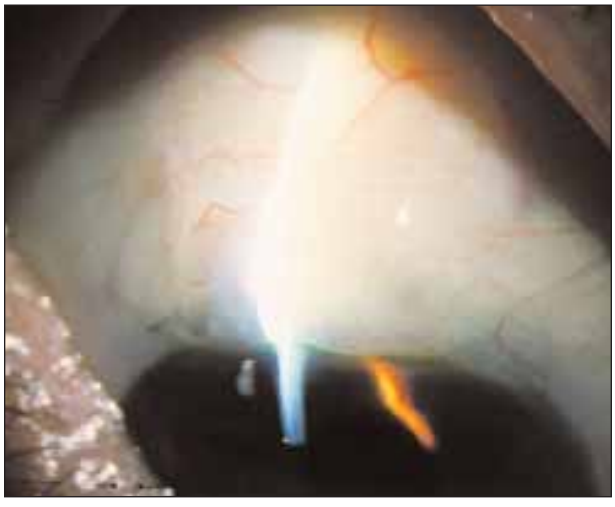

Figure 1. An excellent filtering bleb developed after separate-site combined phacotrabeculectomy.

ited by allergy or medical contraindications. I also may choose a combined procedure in young patients and those who have sustained significant glaucomatous visual field loss and cupping. In addition, I tend to prefer this approach in monocular patients or individuals with significant risk factors for glaucoma such as pseudoexfoliation, pigment dispersion, or angle recession. Lastly, combined cataract and glaucoma surgery is indicated in patients unable to tolerate two separate operations due to medical problems limiting the number of trips to the OR.

Cataract surgery alone may be appropriate for an individual whose IOP is adequately controlled and who has sustained no significant glaucomatous visual field loss or cupping. Many patients experience a small but significant reduction in IOP after clear corneal phacoemulsification.[2] A two-staged procedure, with a glaucoma operation preceding the phaco procedure, may be indicated when glaucoma is an immediate threat to vision (eg, markedly increased IOP in patients with active uveitis or neovascularization). Even in the presence of a visually significant cataract, an IOL may not be indicated in patients with high IOPs and active inflammation. The fact that the phacoemulsification performed after glaucoma surgery is often successful makes this approach a reasonable option for certain patients.

SEPARATE SITES

Theory

Weitzman and Caprioli have argued that performing phacoemulsification and trabeculectomy at separate sites enhances the development of effective filtration[3] (Figure 1). It also permits cataract surgeons to perform phacoemulsification from a position that most find comfortable—a temporal approach.

Technique

First, the ophthalmologist performs phaco/IOL surgery. A small, clear corneal/limbal incision and foldable IOL are preferable to minimize conjunctival manipulation. I favor a single, buried, 10–0 nylon suture to facilitate early digital pressure and supplemental 5-fluorouracil (5-FU), if needed, during the early postoperative phase.

Next, the surgeon shifts to the superior axis to perform the trabeculectomy. The conjunctival flap is mobilized according to his preference, and intraoperative antimetabolites may be used. The surgeon performs his standard trabeculectomy.

Results

Via an evidence-based review, Friedman et al reported better IOP control with a combined procedure performed at separate sites versus a single one.[1] When comparing single- and two-site combined procedures, my colleagues and I found an equal reduction of IOP, degree of visual improvement, and reduction in medication.[4]

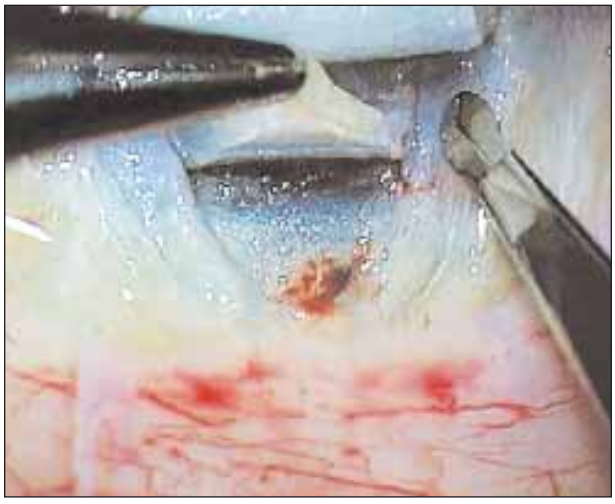

Figure 2. The surgeon mobilized the deep scleral flap to expose Schlemm's canal during combined phacoemulsification and viscocanalostomy surgery.

SINGLE SITE

Theory

A single-incision approach is simple, fast, and effective although potentially less comfortable for the temporally oriented phaco surgeon. An ophthalmologist's choice to perform a single- or separate-site procedure is a matter of preference, but, in all cases, he should make an effort to minimize the manipulation of and trauma to ocular tissue.

Technique

This procedure involves a superior approach, and I favor an inferior, limbal, 6–0 silk positioning suture to facilitate superior exposure of the limbal area. A paracentesis incision permits bimanual phacoemulsification and also enables the testing of filtration outflow at the end of the case. A conjunctival flap is mobilized via a limbus- or fornix-based approach. My colleagues and I found that both limbus- and fornix-based conjunctival flaps are effective for reducing the IOP, developing a bleb, improving vision, and reducing the number of glaucoma medications postoperatively.[5] Most importantly, with a fornix-based flap, one may anticipate more anterior bleb leaks and should closely check for them postoperatively and provide treatment as necessary.

Intraoperative antimetabolites facilitate the reduction of IOP. One may apply topical mitomycin C (0.2 to 0.5 mg/mL) or 5-FU (50 mg/mL) to reduce fibrous proliferation and scarring of the bleb postoperatively.

Scleral flaps can be mobilized in any shape, and the

most important factors for IOP control are the thickness of the flap and the tightness of its closure. If I anticipate performing laser suture lysis postoperatively, I favor 10–0 nylon sutures with the knots buried. Releasable sutures are also effective for regulating and modulating aqueous outflow and the development of a bleb.[6-8]

Multiple suture needles and materials can be used for conjunctival closure. For limbus-based flaps, I favor 9–0 Vicryl (Ethicon Inc., Somerville, NJ), 10–0 BioSorb (Alcon Laboratories, Inc., Fort Worth, TX), or 10–0 nylon. Incorporating Tenon's tissue in the closure may enhance its seal. Fornix-based flaps can be closed with wing sutures, horizontal mattress sutures, or running sutures such as those described by Wise.[9] Wing sutures with denudation of the limbal corneal epithelium reduce the number of sutures in the sclerectomy area and may minimize inflammation, but they also may be associated with more leaks and anterior migration of the bleb. Running sutures utilizing a limbal remnant or the Wise closure reduce bleb leaks and the anterior migration of the bleb, but they may be associated with more inflammation because of suture material near the sclerectomy site.

It is important to test filtration and the elevation of the bleb by injecting balanced salt solution via the paracentesis at the conclusion of the procedure. Topical 2% fluorescein strips or a Weck-Cel sponge (Medtronic ENT, Jacksonville, FL) can be used to test for bleb leakage.

Results

In my hands, a single-incision combined procedure without antimetabolites produced a mean IOP reduction of approximately 5 mm Hg at 1 year and decreased the number of glaucoma medications by approximately 75%.[10] The IOP reduction has been sustained for 3 years in these patients, but their need for medication has tended to increase slightly. Intraoperative antimetabolites are associated with lower IOPs postoperatively but also with more postoperative complications. Subconjunctival 5-FU administered postoperatively can also enhance the bleb's development.

OTHER POSSIBLE COMBINATIONS

A host of other glaucoma procedures can be combined with cataract surgery. Surgeons may couple phacoemulsification and the implantation of a tube shunt such as the Ex-Press mini glaucoma shunt (Optonol Ltd., Neve Ilan, Israel), which creates an external filter. Many new shunting devices are currently under development that will permit the surgeon to perform a trabeculectomy with an internal tube shunt, silicone drainage tube, or a gold implant (Solx Gold Micro-Shunt; Solx, Inc., Waltham, MA) in the suprachoroidal space.

Alternatively, one might perform endoscopic cyclophotocoagulation (ECP) along with phacoemulsification. ECP produces modest postoperative reductions in patients' IOPs and needs for glaucoma medication.[11,12] Moreover, ECP does not appear to be associated with the significant inflammation that occasionally occurs after external cycloablative procedures.[11]

Another option is to combine a nonpenetrating deep sclerectomy procedure with cataract surgery (Figure 2). Park et al reported a reduction in IOP of 3.4 mm Hg at 1 year and 3.6 mm Hg at 3 years with viscocanalostomy and cataract surgery.[13] It would be interesting to read an evaluation of the potential combination of phacoemulsification and 360º canaloplasty with the microcannula developed by iScience Interventional (Menlo Park, CA). The device expands the dilation of Schlemm's canal beyond that normally achieved with standard viscocanalostomy and, like the latter procedure, minimizes bleb development. Techniques utilizing collagen (AquaFlow Collagen Glaucoma Drainage Device; STAAR Surgical Company, Monrovia, CA) or hyaluronic acid actually facilitate the egress of aqueous into the subconjunctival space and can be coupled with deep sclerectomy procedures to facilitate bleb development. Surgeons may use antimetabolites intraoperatively with the nonpenetrating deep sclerectomy procedures aimed at creating blebs.

European ophthalmologists have combined cataract surgery with excimer laser trabeculotomy via an *ab interno* approach, although this technology is not approved in the US. Standard trabeculotomy is another option.[14]

It is also worth noting that goniosynechiolysis can be coupled with cataract surgery and chamber-deepening procedures to open preexisting angle closure. My colleagues and I showed this approach to be effective for angle closure of up to 12 months' duration.[15] Finally, Terry described coupling phacoemulsification and holmium laser sclerostomy,[16] and Montgomery and Gills reported combining cyclodialysis with cataract surgery in 1980.[17]

SUMMARY

There have been tremendous advances in combined surgery during the past 4 decades. In the 1970s, intracapsular surgery with a filter was the most common approach, with the filtration procedure typically occurring first. In the 1980s, the trend became extracapsular procedures with simultaneous trabeculectomies. Improvements in viscoelastics and IOLs along with laser suture lysis and releasable sutures enhanced success rates. In the 1990s, phacotrabeculectomy came into its own with the use of small incisions, foldable IOLs, and antimetabolites.

In the new millennium, surgeons have become more interested in separating the sites for the combined cataract and glaucoma procedure, and they have a greater appreciation for the effect of phacoemulsification alone on IOP. The use of nonpenetrating deep sclerectomy procedures, some of which avoid a bleb, has also grown extensively.

As cataract incisions shrink further, one may imagine a future in which IOLs enhance the visual field or continuously monitor IOP intracamerally, implants release glaucoma medication, antimetabolites are more effective and safer, photodynamic therapy of the conjunctiva modulates fibroblastic proliferation, and novel nonfiltering surgical procedures reduce bleb-associated problems. ■

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