# Success Rates of Combined Phacotrabeculectomies Versus Separately Performed Procedures

### BY MALAIKA DAVID, ASSOCIATE EDITOR



This month's installment of the "Peer Review" column addresses the decision to combine phacoemulsification and trabeculectomy, as a preamble to the August edition of Cataract & Refractive Surgery Today, which will include a discussion of the most current trends in the management of coexisting cataracts and glaucoma. As always, please keep in mind that the peer-reviewed literature frequently lags behind current trends and practices.

Although phacoemulsification and trabeculectomy have often been performed together during the past 25 years, it remains controversial whether a combined procedure or the separated components yield the best long-term control of IOP. In 1959, Epstein proposed that proinflammatory proteins are present in the aqueous of filtering blebs.<sup>1</sup> The exact mediators were identified by Freedman and Goddard in 2008.<sup>2</sup> When pressure rises during the hypertensive phase after trabeculectomy, elevated levels of TGF ß and PGE2 are found in the bleb's aqueous fluid; the resulting effect is a more rapid failure of blebs due to fibrosis. Because both TGF beta and PGE2 are proinflammatory, decreasing their levels lessens inflammation in the bleb's wall and produces a more permeable bleb.<sup>3</sup> Today, more potent topical steroids like Durezol (difluprednate ophthalmic emulsion 0.5%; Sirion Therapeutics) and nonsteroidal anti-inflammatory drugs like Xibrom (bromfenac 0.09%; Ista Pharmaceuticals, Inc.) are available. These newer steroid and nonsteroidal topical medications penetrate the anterior chamber rapidly and provide high bioavailability with minimized dosing regimens.

A further consideration is the recent development of adjunctive nonpenetrating procedures such as the implantation of the AquaFlow Collagen Glaucoma Drainage Device (STAAR Surgical Company, Monrovia, CA) or canaloplasty with the iTrack 250A Microcatheter (iScience Interventional, Menlo Park, CA), which require a two-site approach. At this year's American Society of Cataract and Refractive Surgery Symposium in Boston, Marlene Moster, MD, advocated that cataract surgery in less advanced cases of glaucoma (ie, patients on one or two medications with minimal field loss) may be combined with endoscopic cyclophotocoagulation, canaloplasty, or ab interno trabeculotomy (Trabectome; NeoMedix Corporation, Tustin, CA). She reserves filtering surgery for more complicated cases or, if needed, in eyes for which the aforementioned modalities fail.

I hope you enjoy this installment of "Peer Review," and I encourage you to seek out and review the articles in their entirety at your convenience.

-Mitchell C. Shultz, MD, section editor

#### LOSS OF ENDOTHELIAL CELLS

In an observational, retrospective study, Aoro-Martinez et al assessed damage to endothelial cells after trabeculectomy alone versus phacotrabeculectomy with IOL implantation. Eighty eyes (62 patients) were divided into one control group and three experimental groups, in which trabeculectomy or phacotrabeculectomy and IOL implantation were performed. Mean BCVA was 20/20 in the control group, 20/24 in the group that underwent trabeculectomy alone, 20/32 in the group that underwent phacotrabeculectomy with IOL implantation in a one-step procedure, and 20/34 in the group that underwent phacotrabeculectomy with IOL implantation in a two-step procedure. Mean corneal endothelial cellular density ( $\pm$ SD) was 2,619  $\pm$ 319 mm<sup>2</sup> in the control group, 2,447  $\pm$ 425 mm<sup>2</sup> in the trabeculectomy group, 1,968  $\pm$  342 mm<sup>2</sup> in the one-step phacotrabeculectomy group, and 1,551  $\pm$ 323 mm<sup>2</sup> in the two-step phacotrabeculectomy group. Investigators noted that, although corneal endothelial cellular density was lower in the experimental groups than in the control group, only the phacotrabeculectomy groups showed cellular densities significantly lower than in the control group (P = .0004 in group 2 and P = .00001 in group 3).<sup>4</sup>

#### PHACOTRABECULECTOMY VERSUS TRABECULECTOMY

In a retrospective study, researchers from the Institute of Clinical Medicine in Taipei, Taiwan, compared the long-term efficacy and safety of phacotrabeculectomy with that of trabeculectomy alone in patients with primary angle-closure glaucoma (PACG). The investigators examined the hospital files of 99 patients with PACG. Seventy-five of the patients underwent phacotrabeculectomy, and 24 underwent trabeculectomy alone. By 3 years postoperatively, the success rate was 56% in the phacotrabeculectomy group and 54% in the trabeculectomy group (P = .903). Success was defined as either a greater than 20% reduction in IOP or an IOP that remained below 15 mm Hg. There were no significant differences between groups in terms of either IOP or the number of glaucoma medications used during the 3-year follow-up period. The incidence of postoperative complications was similar in both groups (P = .232). The combined group did not require any IOP-lowering surgical procedures, whereas 54% of eyes in the trabeculectomy group required cataract extraction or IOP-lowering surgical procedures (P < .001).<sup>5</sup>

In a retrospective cohort study, data on 85 glaucomatous eyes that underwent trabeculectomy with mitomycin C (MMC) were compared to data on 105 glaucomatous eyes that underwent phacotrabeculectomy with "The combined group did not require any IOP-lowering surgical procedures, whereas 54% of eyes in the trabeculectomy group required cataract extraction or IOP-lowering surgical procedures (*P* < .001)."

MMC between 1996 and 2003. In both groups, a statistically similar proportion of patients achieved their target IOP range at 1 and 2 years postoperatively. The cumulative success rate at 2 years was 29.04% in the trabeculectomy group and 22.91% in the phacotrabeculectomy group (P = .44) without add-on glaucoma therapy; 25.38% in the trabeculectomy group and 25.22% in the phacotrabeculectomy group (P = .60) with the use of up to two glaucoma medications; and 30.01% in the trabeculectomy group and 25.17% in the phacotrabeculectomy group (P = .81) with the use of any number of glaucoma medications. The mean postoperative IOP was also similar in the two groups at almost all follow-up visits for up to 2 years. The mean decrease in IOP from baseline was significantly greater in the trabeculectomy group throughout the study period (-10.87 ±8.33 mm Hg in the trabeculectomy group vs -6.15 ±7.01 mm Hg in the phacotrabeculectomy group at 2 years, P = .003). However, baseline IOP was also higher in the trabeculectomy group (26.1 mm Hg vs 20.3 mm Hg, P < .0001).6

In a prospective study, Kaplan-Messas et al compared the 1-year outcomes of trabeculectomies and combined phacotrabeculectomies that were performed with or without peripheral iridectomy. Forty-seven patients who were scheduled to undergo either a primary trabeculectomy or phacotrabeculectomy were randomized to undergo those procedures with or without peripheral iridectomy (PI). The PI group consisted of 18 patients who underwent phacotrabeculectomy and six who underwent trabeculectomy. The no-PI group consisted of 18 patients who underwent phacotrabeculectomy and five who underwent trabeculectomy. Complete success rates were defined as having an IOP of 18 mm Hg or less with medications, and qualified success rates were defined as having an IOP of 18 mm Hg or less without medications. Investigators reported complete success in 70% of patients and qualified success in more than 90% of patients. One patient from the no-PI group developed iris incarceration on postoperative day 1, which required surgery.<sup>7</sup>



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#### PHACOTRABECULECTOMY VERSUS PHACOEMULSIFICATION

In a randomized controlled study of 72 eyes (72 patients), 32 eyes received phacoemulsification alone, and 34 eyes underwent phacotrabeculectomy. Results were measured with indentation gonioscopy and ultrasound biomicroscopy. By 1 year postoperatively, the mean extent of synechial angle closure was significantly reduced from 266.4° to 198.9° (P < .001) in the eyes that received phacoemulsification alone and from 266.0° to 227.2° (P = .03) in the eyes that received phacotrabeculectomy. The mean distance of the angle opening was significantly increased from 208.0 to 468.0  $\mu$ m (P < .001) in the eyes that underwent phacoemulsification and from 214.6 to 344.4  $\mu$ m (P < .001) in the eyes that underwent phacotrabeculectomy. The mean trabecular-ciliary process distance grew significantly from 824.6 to 1043.6  $\mu$ m (P < .001) in the phacoemulsification-alone group and from 800.9 to 951.5  $\mu$ m (*P* = .01) in the phacotrabeculectomy group. The mean anterior chamber depth increased significantly from 1,798.6 to 3,528.4  $\mu$ m (*P* < .001) in the phacoemulsification-alone group and from 1,781.6 to 3,297.8  $\mu$ m (*P* < .001) in the phacotrabeculectomy group. Additionally, phacoemulsification alone resulted in a significantly greater postoperative distance of angle opening at 500  $\mu$ m from the scleral spur (*P* < .001) and greater anterior chamber depth (P < .001) than did phacotrabeculectomy.8

In a retrospective study, investigators evaluated data from case records on 180 patients who underwent phacoemulsification using a temporal incision and IOL implantation or one-site phacotrabeculectomy between 1997 and 2001. Ninety patients underwent phacotrabeculectomy with IOL implantation, and 90 patients underwent phacoemulsification alone. In the phaco group, 73% of the patients achieved their preoperative intended refraction compared with 76.6% of patients in the phacotrabeculectomy group. In the phaco group, 10% had surgically induced against-the-rule astigmatism compared with 15.5% in the phacotrabeculectomy group. In the phaco group, 75.5% of patients had a preoperative BCVA of worse than 6/12, and 95.5% of the patients achieved a postoperative BCVA of better than or equal to 6/12. In the phacotrabeculectomy group, 31.1% of patients had a preoperative BCVA of worse than 6/12, and 90% of patients achieved a postoperative BCVA equal to or better than 6/12.9

#### PHACOTRABECULECTOMY IN ANGLE-CLOSURE GLAUCOMA

Seventy-two medically controlled eyes (72 patients) with chronic angle-closure glaucoma (ACG) and coex-

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isting cataract were randomized to two groups for a controlled study. Group 1 comprised 35 eyes that underwent phacoemulsification alone, and group 2 consisted of 37 eyes that underwent combined phacotrabeculectomy with adjunctive MMC chemotherapy treatment. Postoperative study visits were scheduled at 1 month, 3 months, and every 3 months after that for a minimum of 2 years. Except at 1 month (P = .001) and 3 months (P = .008), there were no statistically significant differences (P > .05) in preoperative or postoperative mean IOP between the two groups. The mean number of topical glaucoma medications in group 2 was statistically significantly lower (P < .001) at all postoperative visits compared with those of group 1. Investigators noted that the differences in IOP control were not associated with differences in glaucomatous progression. Group 2 had significantly more postoperative complications than group 1 (P < .001).<sup>10</sup>

Fifty-one patients (51 eyes) with medically uncontrolled chronic ACG and coexisting cataract were randomized into two groups. Group 1 was made up of 27 eyes that underwent phacoemulsification alone, and group 2 consisted of 24 eyes that underwent combined "The most common additional procedure required [after phacotrabeculectomy and IOL implantation] was laser suture lysis in 29% of the one-incision group and 42% of the two-incision group."

phacotrabeculectomy with adjunctive MMC chemotherapy treatment. Group 2 had a lower mean postoperative IOP than group 1 at 3 months (P = .01), 15 months (P = .02), and 18 months (P = .01). Group 2 also required 1.25 fewer topical glaucoma medications (P < .001) than group 1 at the 24-month postoperative visit. Group 2 had significantly more postoperative complications than group 1 (P = .001).<sup>11</sup>

Vizzeri and Weinreb summarized recent advances in the management of patients with coexisting cataract and glaucoma. The researchers found that cataract sur-



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gery may be useful in the clinical management of eyes with ACG, but recent studies show that the decrease in IOP after cataract surgery alone may be "limited and transient." Investigators noted that phacotrabeculectomies remain the preferred option, and they stated that the use of MMC should be considered in all cases of combined cataract surgery and trabeculectomy.<sup>12</sup>

#### PHACOTRABECULECTOMY ALONE

In a retrospective study, investigators reviewed the medical records for 60 eyes (43 patients) that had phacotrabeculectomies at the Eye Institute of Utah in Salt Lake City between 1999 and 2008. At a 30-month postoperative visit, 60% of eyes had achieved IOP control ( $\leq 21 \text{ mm Hg}$ ) with or without medication. Fifty percent of eyes had an IOP of 15 mm Hg or lower, and 57% had an IOP reduction of at least 30%. The mean number of glaucoma medications changed from 1.63 ±0.69 preoperatively to 0.23 ±0.50 at the final postoperative visit. Eighty-seven percent of eyes had a BSCVA of 20/40 or better.<sup>13</sup>

Investigators in a prospective interventional case series studied the short-term results of phacotrabeculectomies in 304 consecutive eyes. Preoperatively, the mean IOP was 20.0  $\pm$ 6.3 mm Hg (SD). At 6 months postoperatively, the mean IOP was 14.8  $\pm$ 3.5 mm Hg, and at 1 year postoperatively, it was 15.5  $\pm$ 2.9 mm Hg. There was a corresponding drop in glaucoma medications from 2.65  $\pm$ 1.13 at baseline to 1.76  $\pm$ 1.25 at 6 months and 1.44  $\pm$ 1.29 at 1 year. Secondary glaucoma procedures were performed on nine patients. Seventy-four percent of patients experienced a reflux of blood, which resolved within a few days.<sup>14</sup>

#### PHACOTRABECULECTOMY: ONE SITE OR TWO?

In a retrospective study, 302 eyes (235 patients) underwent phacotrabeculectomy and IOL implantation with one incision, and 93 eyes (81 patients) underwent phacotrabeculectomy and IOL implantation with two incisions. Starting at 1 year, postoperative followup visits occurred between 12 and 130 months, at an average of 49.2 months. Both techniques were found to be equally effective at reducing IOP by an average of 8.1 mm Hg. Of the eyes that underwent phacotrabeculectomy with one incision, the visual acuity improved for 57%, did not change for 27%, and deteriorated in 16%. Of the eyes that underwent phacotrabeculectomy with two incisions, the visual acuity improved for 69%, did not change for 25%, and deteriorated in 6%. The IOP decreased to an average of 13.77 mm Hg in the eyes that underwent phacotrabeculectomy with one

incision and to an average of 14.9 mm Hg in the eyes that underwent phacotrabeculectomy with two incisions. The number of antiglaucoma medications used in the one-incision group changed from an average of 2.4 preoperatively to 0.6 preoperatively. For the two-incision group, the number of medications changed from 2.3 to 0.5. The most common adverse events postoperatively were scarring of the filtering bleb (which occurred in 35% of the one-incision group and 34% in the two-incision group) and choroidal detachment (which occurred in 7% of the one-incision group and 9% of the two-incision group). The most common additional procedure required was laser suture lysis in 29% of the one-incision group and 42% of the two-incision group.<sup>15</sup>

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