# Combined Phacoemulsification and Goniosynechialysis for Uncontrolled Chronic Angle-closure Glaucoma after Acute Angle-closure Glaucoma

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***Objective:*** To evaluate combined phacoemulsification, posterior chamber intraocular lens (PCIOL) implantation, and goniosynechialysis (phaco-GSL) prospectively in eyes with more than 180° of peripheral anterior synechiae (PAS) and uncontrolled intraocular pressure (IOP) when performed within 6 months of an attack of acute angle-closure glaucoma (ACG).

***Design:*** Prospective, noncontrolled clinical trial.

***Participants:*** Patients who had presented with acute ACG and had persistently uncontrolled IOP despite successful laser iridotomy for pupillary block and argon laser peripheral iridoplasty for continued appositional closure after iridotomy.

***Intervention:*** After the completion of phacoemulsification and posterior chamber lens implantation, goniosynechialysis was performed in 52 eyes of 48 patients.

***Main Outcome Measures:*** Postoperative visual acuity, IOP, extent of PAS, and number of medications, if any, required for IOP control.

***Results:*** Intraocular pressure was less than 20 mmHg in 47 eyes (90.4%) without medications; 4 were controlled with medications and 1 required filtration. Mean extent of PAS was reduced from 310° to 60°. Peripheral anterior synechiae formation or IOP elevation did not recur after 3 months after surgery up to 6 years. Eight patients achieved 20/20 visual acuity, while 44 patients had less than 20/20 visual acuity. No patient had worse visual acuity after surgery compared to before surgery.

***Conclusion:*** Phaco-GSL and PCIOL implantation is effective in reducing PAS and IOP and improving visual acuity in eyes with persistent chronic ACG when performed within 6 months after treatment for acute ACG.
*Ophthalmology 1999;106:669–675*

In chronic angle-closure glaucoma (ACG), portions of the anterior chamber angle are permanently closed by peripheral anterior synechiae (PAS).[1] Control of intraocular pressure (IOP) after elimination of appositional closure depends on the amount of damage to the trabecular meshwork, which may or may not correlate with the extent of PAS. Intraocular pressure is usually elevated when more than 180° of the angle is closed by PAS. When more than 270° of the angle is closed, medical therapy is usually ineffective and filtering surgery becomes necessary.[2]

Originally received: October 27, 1997.
Revision accepted: November 3, 1998. Manuscript no. 97616.

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Presented in part at the American Academy of Ophthalmology annual meeting, San Francisco, California, October 1997.

Supported in part by the Ramathibodi Foundation, Bangkok, and the Glaucoma Center Development Fund of the New York Eye and Ear Infirmary.

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Goniosynechialysis (GSL) is a surgical procedure designed to strip PAS from the angle wall and restore trabecular function in eyes with chronic ACG.[2] The procedure is successful in approximately 80% of eyes if the PAS have been present for less than 1 year.[2] Although GSL has not become widely popular in the United States, it has in Japan, where promising results have been reported in both phakic and pseudophakic eyes.[3–5] It can be effective in ACG when performed by itself, in conjunction with other surgical procedures,[5,6] and after failed filtration surgery.[7]

The shallow anterior chamber characteristic of eyes with ACG makes performing GSL more difficult than it would be in an eye with a widely open angle. An enlarged, cataractous lens or anterior movement of the lens, such as commonly found in exfoliation syndrome, can force the iris against the trabecular meshwork, resulting in reformation of PAS. Chamber deepening[8] before GSL is an integral part of the procedure.[2] Cataract extraction before GSL makes chamber deepening unnecessary.

Chronic ACG is a serious problem in the countries of East Asia. Eyes of Orientals are widely believed to be more prone to develop ACG,[9] particularly creeping ACG with PAS formation.[10] Goniosynechialysis is very effective in

lowering IOP in Oriental eyes with ACG and PAS.[5] It is even more effective when combined with extracapsular cataract extraction (ECCE).[5] To avoid potential postoperative problems associated with the lens, combined GSL and lens extraction has been advocated.[11] Lens extraction, even in eyes with good visual acuity, may open the angle and normalize IOP.[12,13]

Phacoemulsification is associated with less iris trauma and postoperative inflammation than ECCE and should theoretically improve results when combined with GSL. We present our results of combined phacoemulsification and GSL (phaco-GSL) in 52 eyes of 48 patients with ACG who had formed PAS within 6 months of an acute attack of ACG.

## Patients and Methods

The study population consisted of 52 eyes of 48 Thai patients (34 women, 14 men) who had presented to the Glaucoma Service at Ramathibodi Hospital, Bangkok, with acute ACG and who had been successfully treated with laser iridotomy and, for those eyes with persistent appositional closure after elimination of pupillary block by iridotomy, that had undergone argon laser peripheral iridoplasty but continued to have uncontrolled IOP of 21 mmHg or greater receiving antiglaucoma medications in the presence of at least 180° of synechial angle-closure. These eyes underwent combined phaco-GSL and posterior chamber intraocular lens (PCIOL) implantation within 6 months of the initial attack of acute ACG. Twelve eyes had undergone prior GSL alone, but PAS and elevated IOP had recurred. No eyes had uveitis, rubeosis iridis, or previous trauma. Patients with advanced glaucomatous cupping, suggestive of prolonged IOP elevation, uncertain history of acute attack, acute attack having occurred greater than 6 months previously, or absence of typical signs of an acute attack, such as sphincter paralysis or glaukomflecken, were excluded. Eyes with intumescent cataracts (phacomorphic glaucoma) or asymmetric anterior chamber depths differing by more than 0.3 mm and eyes with lens dislocation or malignant glaucoma were also excluded. During the first 2 to 3 years, not all patients meeting the criteria for enrollment underwent this procedure. When the procedure was found to be safe and effective and the surgical technique was improved and mastered, more patients were recruited.

Preoperative evaluation included visual acuity testing, slit-lamp biomicroscopy, and ophthalmoscopy. Anterior chamber depths were measured with a Haag–Streit pachymeter. Indentation gonioscopy was performed with a Zeiss four-mirror goniolens to distinguish appositional from synechial closure.[14] The extent of PAS (i.e., area of the trabecular meshwork covered by PAS) in each quadrant of the angle was estimated to the nearest 15° in an unmasked fashion. Preoperative A-scan biomicroscopy was performed with the immersion technique for measurement of anterior chamber depth, lens thickness, and axial length, which were used for IOL calculation.

### Surgical Procedure

All eyes underwent combined phaco-GSL and PCIOL implantation. The procedure was performed using retrobulbar anesthesia. Three corneal paracentesis tracks were made with a 15° disposable sharp blade at the 3-o'clock, 7-o'clock, and 11-o'clock positions for the right eye and at the 2-o'clock, 5-o'clock, and 9-o'clock positions for the left eye. A small (4–5-mm) diameter capsulorhexis was created. Phacoemulsification and cortical aspiration were performed through a temporal scleral incision followed by implantation of either a 5.5-mm polymethylmethacrylate (PMMA) or a 6.5-mm-diameter foldable silicone-plated PCIOL. The scleral wound was closed with interrupted sutures, and a viscoelastic agent was injected to deepen the anterior chamber to supernormal depth and raise the IOP.

The patient's head was tilted to the side opposite a chosen paracentesis track to orient the iris surface parallel to the optical axis of the microscope. Intraoperative direct gonioscopy was performed with a Barkan operating goniolens, and GSL was performed only if 180° or more of PAS was confirmed. A blunt Swan knife was inserted into a chosen paracentesis track and advanced toward the opposite angle under direct visualization. The knife tip was then pressed against the most peripheral iris adjacent to the point of angle adhesion and pressed posteriorly until the trabecular meshwork was exposed. Horizontal sweeping of the knife tip or excessive force that could cause hemorrhage or an inadvertent cyclodialysis cleft was avoided. If hemorrhage occurred, additional viscoelastic was injected into the anterior chamber to raise IOP. The bleeding usually localized as a droplet and did not disperse to obscure the surgical field. The procedure was repeated in adjacent areas, using the other paracentesis tracks, until the entire angle was open. All PAS were eliminated intraoperatively. Visualization through the Barkan lens could be achieved by a combination of tilting the patient's head, paracentesis position, and a viscoelastic. Hyphemas were limited but did not obscure the surgical view. The viscoelastic was then evacuated and replaced with balanced salt solution. In the last 11 patients, additional pupilloplasty was performed with 10–0 Prolene (Ethicon) sutures to constrict the atonic dilated pupil.

After surgery, patients were prescribed topical steroids, antiglaucoma medications, and antibiotics. In cases of fibrinoid anterior chamber reaction, systemic steroids were also administered. Medications were tapered within 6 weeks. The patients were followed regularly every 3 months. Best-corrected visual acuity, IOP, and extent of PAS were recorded. Results are reported as the mean ± standard deviation.

Table 1. Preoperative and Postoperative Data: Mean (Range)

| | Preoperative | Postoperative |
|---|---|---|
| IOP (mmHg) | 29.7 ± 7.9 (24–61) | 13.2 ± 2.9* (8–28) |
| PAS (°) | 308.6 ± 79.5 (180–360) | 56.2 ± 57.6† (0–300) |
| Medications | 2.4 ± 0.9 (1–4) | 0.1 ± 0.3† (0–2) |

IOP = intraocular pressure; PAS = peripheral anterior synechiae.

* $P < 0.0001$, paired $t$ test.

† $P < 0.001$, Wilcoxon matched-pairs signed-ranks test.

## Results

Mean patient age was 59.6 ± 10.6 years (range, 38–91 years). There was a statistically significant difference between preoperative and postoperative IOP, PAS, and number of medications required for IOP control (Table 1). The mean time from the acute attack to surgery was 9.3 ± 6.4 weeks (range, 2–27 weeks). The mean anterior chamber depth was 2.33 ± 0.54 mm (range, 1.73–3.87 mm), mean lens thickness was 4.83 ± 0.67 mm (range, 3.5–5.64 mm), and mean axial length was 22.30 ± 0.83 mm (range, 20.67–24.25 mm) by A-scan ultrasound biometry.

Table 2. Preoperative and Postoperative Best-corrected Visual Acuity

| Preoperative (number) | Postoperative (number) |
|---|---|
| 20/30 (7) | 20/20 (2), 20/30 (5) |
| 20/40 (9) | 20/20 (1), 20/30 (4), 20/40 (4) |
| 20/50 (7) | 20/20 (1), 20/40 (3), 20/50 (3) |
| 20/70 (7) | 20/20 (1), 20/30 (2), 20/40 (1), 20/50–70 (3) |
| 20/100 (7) | 20/30 (2), 20/40 (1), 20/50–70 (3), 20/100 (1) |
| 20/200 (9) | 20/20 (2), 20/30 (1), 20/40 (1), 20/70 (5) |
| <20/200 (6) | 20/20 (1), 20/30 (2), 20/40 (1), 20/70 (2) |

A PMMA biconvex PCIOL was implanted in 43 eyes, and a silicone-plated biconvex PCIOL was implanted in 9 eyes. The mean power of the PMMA IOL was 23.12 ± 2.29 diopters (range, 18.5–27 diopters) and that of the foldable silicone IOL was 23.9 ± 1.4 diopters, (range, 22.5–26 diopters). The mean central thickness values of the PMMA and silicone intraocular lenses were 0.75 and 1.42 mm, respectively. Postoperative visual acuities were either improved or unchanged (Table 2). No patient had worsened best-corrected visual acuity.

Mean follow-up was 20.8 ± 15.5 months (range, 5–76 months). At the final examination for each patient, IOP was 13.2 ± 2.9 mmHg (range, 8–28 mmHg) (Table 3). The extent of recurrent PAS was 56 ± 58° (range, 0–300°), and the number of antiglaucoma medications was 0.1 ± 0.3 (range, 0–2). Nine patients were lost to follow-up during the first year after surgery, three more were lost during the second year, and three more lost during the third year.

There was no correlation between preoperative and postoperative IOP (Table 4). Intraocular pressure was less than 20 mmHg in 47 eyes (90.4%) without medications; 4 eyes were controlled with medications and 1 required filtration surgery. In the 47 eyes with successful phaco-GSL, the mean time between the angle-closure attack and surgery was 8.3 ± 6.4 weeks. Of the five patients with unsuccessful phaco-GSL, three had surgery within 4 weeks after the attack and the other two had surgery after 4 months (Table 5). There was only borderline or no significant difference between the success of patients undergoing PMMA versus silicone IOL implantation by Fisher's exact test ($P = 0.054$, alpha or type-one error = 0.05). Comparison of the success in eyes with PMMA and eyes with silicone intraocular lenses may be invalid, since the number of silicone-implanted eyes was small.

Reduction of IOP correlated with the extent of recurrent PAS ($P = 0.0051$, $t$ test for unpaired data). In patients with IOP less than 21 mmHg, the mean extent of PAS was 56.9 ± 42.7°, while in those who required medications or filtering surgery, it was 125.0 ± 98.1°. No eye developed hypotony. In the clinical judgment of the examiner, those who required antiglaucoma medications needed them from the first 2 months after surgery. Those who could discontinue medications after the first 3 months did not need them again later.

Table 3. Mean Postoperative Intraocular Pressure (IOP) at Intervals up to 6 Years

| Time | IOP (mmHg) |
|---|---|
| 3–6 mos | 14.1 ± 3.7 (n = 52) |
| 6–12 mos | 13.5 ± 3.5 (n = 43) |
| 1–2 yrs | 13.4 ± 3.3 (n = 31) |
| 2–3 yrs | 13.7 ± 2.0 (n = 16) |
| 3–6 yrs | 13.4 ± 1.6 (n = 10) |

Table 4. Preoperative versus Postoperative Intraocular Pressure

| Preoperative (mmHg) (range) | Postoperative (mmHg) (mean ± SD, range, number) |
|---|---|
| 21–25 | 13.1 ± 1.8 (10–16, n = 17) |
| 26–30 | 15.0 ± 4.4 (8–28, n = 14) |
| 31–40 | 12.2 ± 2.6 (8–18, n = 16) |
| 41–60 | 12.0 ± 1.4 (10–14, n = 5) |

SD = standard deviation.

## Complications

A plasmoid or fibrinoid aqueous reaction was the most common complication (Table 6). This occurred frequently when surgery was performed within 2 weeks after the acute attack and uncommon when surgery was performed more than 4 weeks after the attack. Ten eyes that developed fibrinoid reaction had the operation within 4.85 ± 3.8 weeks after the acute attack.

Seven patients reported photophobia after surgery; however, this spontaneously disappeared in six of them. Only one patient required surgical pupilloplasty. None of the 11 patients who had pupilloplasty at the time of surgery developed photophobia.

Five patients had an IOP elevation on the first postoperative day despite prophylactic antiglaucoma medications. The IOP was lowered at the slit lamp by pressing the posterior lip of the inferotemporal paracentesis with a 30-gauge needle to allow egress of the aqueous mixed with residual viscoelastic. None of these patients later required antiglaucoma medications.

Five patients developed limited hyphemas (<⅙ of the anterior chamber height in sitting position). These cleared spontaneously within 5 days without complications. Irregular pigmentation on the re-exposed trabecular meshwork was the usual gonioscopic finding (Fig 1). None developed a cyclodialysis cleft. If they did so at all, PAS usually recurred during the first 2 postoperative months.

To assess the possibility that final visual acuities could have been reduced by a substantial incidence of cystoid macular edema (CME) from the iris manipulation during the procedure, 16 of the 17 patients with visual acuity worse than 20/40 were recalled during July 1998. Refraction, automated perimetry, optic disc examination, and stereoscopic evaluation of the macula were performed. Three patients, with best visual acuities of 20/50, 20/50,

Table 5. Characteristics of Patients with Unsuccessful Phaco-GSL

| Patient No. | Characteristics |
|---|---|
| 1 | Had surgery in the 4th week after attack, developed fibrinoid reaction, recurrent PAS 300°, needed filtering surgery |
| 2 | Had surgery in the 2nd week after attack, developed fibrinoid reaction, postop PAS 90°, needed one medication |
| 3 | Had surgery in the 4th week after attack, did not develop fibrin reaction, postop PAS 90°, needed one medication |
| 4 | Had surgery in the 17th week after attack, did not develop fibrin reaction, postop PAS 90°, needed one medication |
| 5 | Had surgery in the 16th week after attack, did not develop fibrin reaction, postop PAS 60°, needed one medication |

GSL = goniosynechialysis; PAS = peripheral anterior synechiae.

Table 6. Complications

| Complication | No. |
|---|---|
| Fibrinoid anterior chamber reaction | 10 |
| Photophobia | 7 |
| Transient IOP elevation > 25 mmHg | 5 |
| Hyphema | 5 |

IOP = intraocular pressure.

and 20/70, had clinically evident CME. These patients had had surgery at 3, 6, and 7 weeks after the acute angle-closure attack, and all had developed a fibrinoid reaction during the early postoperative period. The patient with the worst acuity, 20/200, had developed diabetic maculopathy. Three had macular changes compatible with age-related macular degeneration. The remaining nine patients had normal maculae. Visual field testing showed a nonspecific decrease in threshold sensitivity. They had 6- to 7-mm nonreactive paralytic pupils.

## Discussion

Forces causing blockage of the trabecular meshwork by the iris may be viewed as originating at four successive anatomic levels: the iris (level 1, pupillary block), the ciliary body (level 2, plateau iris), the lens (level 3, phacomorphic glaucoma), and posterior to the lens (level 4, malignant glaucoma).[15] The more posterior the level at which the angle-closure occurs, the more complex is diagnosis and treatment, since each level may have a component of the preceding levels.

In chronic ACG, portions of the anterior chamber angle are permanently closed by PAS.[1] Peripheral anterior synechiae may form in more than one way. Closure is often circumferential in eyes with darker irides, beginning in the deepest portion of the angle and occurring evenly in all quadrants, giving the appearance over time of a progressively more anterior iris insertion (creeping angle-closure).[10] It has long been assumed that eyes with progressive PAS formation may develop an acute attack of angle-closure when pupillary block closes the remaining portions of the angle unaffected by PAS.[1] In other eyes, closure may begin at the level of Schwalbe's line.[16–18] Permanent PAS may also form during an acute attack and remain after iridotomy has eliminated pupillary block. When PAS are first noted after an acute attack has been broken, it is often, if not usually, difficult or impossible to differentiate these causes.

Continued appositional angle-closure in the presence of a patent iridotomy is an indication for argon laser peripheral iridoplasty.[19,20] Angle-closure caused by level 3 or 4 block is often unresponsive to iridotomy, although iridotomy should be performed to eliminate a pupillary block component. Appositional closure remaining after iridotomy can be partially or entirely eliminated by argon laser peripheral iridoplasty.[19,21–23]

After elimination of pupillary block by iridotomy and residual appositional closure by argon laser peripheral iridoplasty, gonioscopy is necessary to evaluate the extent of synechial closure. Control of IOP after elimination of appositional closure depends on the amount of damage to the trabecular meshwork, which may or may not correlate with the extent of PAS. Intraocular pressure is usually elevated when more than 180° of the angle is closed by PAS. When more than 270° of the angle is closed, medical therapy is usually ineffective and filtering surgery becomes necessary.[2]

Irreversible damage to the trabecular meshwork occurs in areas of persistent PAS with proliferation of iris tissue into the intertrabecular spaces, obstructing aqueous outflow. Trabeculectomy is currently the definitive procedure for chronic ACG when IOP is uncontrolled. Nevertheless, filtration surgery has potentially serious complications, which are more common in eyes with ACG than in eyes with open-angle glaucoma. Flat anterior chamber and malignant glaucoma occur more often in eyes with ACG. Use of antifibrotic agents has increased the possibility of late bleb-related endophthalmitis and bleb leaks.[24] Filtration failure occurs over time.[25]

Elimination of PAS and possible restoration of trabecular function before irreversible structural changes is a logical approach to the treatment of chronic ACG. Goniosynechialysis has been described to disinsert PAS.[2] Complications include bleeding, creation of an iridodialysis during surgery, and marked postoperative inflammation.[26] It is effective in patients with PAS present for less than 6 months to 1 year.[2] However, the long-term success of GSL also depends on the initial mechanism or mechanisms causing synechial closure. Peripheral anterior synechiae may recur if the mechanism is still present. Twelve of our patients had undergone GSL alone and had recurrent PAS with elevated IOP. Argon laser peripheral iridoplasty can also be used after surgery to further flatten the peripheral iris and prevent synechial reattachment.[27]

In our patients, the mean preoperative lens thickness by A-scan biometry was 4.83 mm. Replacement of the natural lens with a PCIOL provided more space (4.08 mm for PMMA intraocular lenses and 3.41 mm for silicone intraocular lenses) within the anterior segment, providing ample

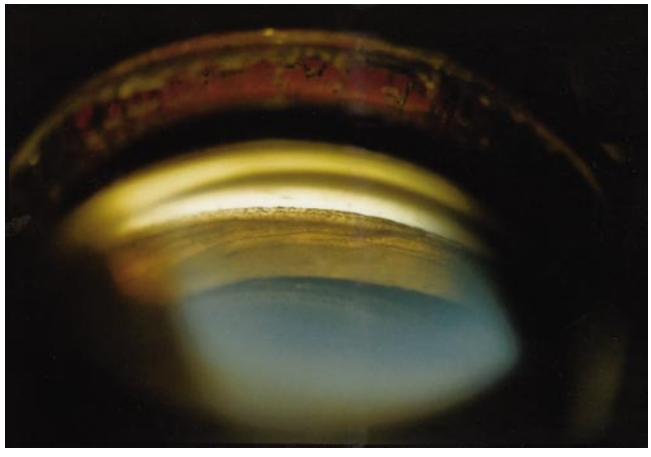

**Figure 1.** Postoperative gonioscopy showing exposure of the trabecular meshwork with irregular pigmentation and remaining tiny peripheral anterior synechiae.

room to perform GSL and decreasing crowding of the anterior chamber angle, lessening the chance of PAS recurrence. The success of GSL is similar in our study between eyes with PMMA and silicone IOP implantation.

Cataract extraction with PCIOL implantation is effective in patients with primary ACG. Greve[27] has reported the effect on IOP of ECCE and PCIOL implantation in 21 eyes of 20 patients with primary ACG. In 14 cases, ECCE was performed in lieu of a filtering procedure. Only five eyes needed antiglaucoma medication after surgery. The IOP was reduced even if extensive PAS were present or ECCE was performed after a failed filtering procedure. Greve concluded that ECCE with PCIOL implantation should be seriously considered as the procedure of choice in primary ACG instead of a filtering procedure or combined cataract extraction and filtration. Gunning and Greve[12] advocated cataract extraction over filtration surgery, even in eyes with good visual acuity.

The success rate of GSL in aphakic eyes (87%) is twice that in phakic ones (42%).[5] Tanihara et al[5] performed GSL before cataract extraction when the two were combined. Lens extraction was combined with GSL in 63% of eyes. Success as determined by IOP less than 20 mmHg was 87% in aphakic and pseudophakic eyes and 42% in phakic eyes after the first GSL. Five-year success was 82.6% and 37.6%, respectively. In eight of ten eyes that had undergone unsuccessful GSL alone, IOP came under control after a second GSL combined with lens extraction.[5] In the series of Shingleton et al,[6] two patients who underwent GSL combined with ECCE also had good postoperative IOP control. Twelve of our patients who had uncontrolled IOP after initial GSL alone had IOP less than 20 mmHg without medications after phaco-GSL.

In our patients, postoperative IOP was reduced to the low to mid-teens regardless of the preoperative level. No eye developed a wound leak or cyclodialysis cleft. Postoperative hyposecretion is unlikely to be responsible for the IOP reduction, since no patient developed hypotony and mean IOP was stable 3 months after surgery. Successful GSL is accompanied by increased tonographic outflow facility.[5]

The success rate of phaco-GSL did not change after the third postoperative month. The IOP and extent of PAS have been stable for up to 6 years, suggesting that long-lasting success without gradually increasing chances of failure is possible. Phaco-GSL is best for those who have had a previously normal trabecular meshwork that has recently developed synechial closure. Candidates for phaco-GSL should have uncontrolled IOP and synechial closure after a patent laser iridotomy and peripheral iridoplasty.

The shorter the duration of synechial closure, the better the prognosis. Among the five patients who had unsuccessful phaco-GSL (Table 5), patients 4 and 5 had surgery performed 4 months after the acute attack. However, a fibrinoid anterior chamber reaction commonly occurred if the operation was performed during the first 4 weeks after the acute attack (patients 2 and 3 in Table 5). Therefore, the best timing for the operation appears to be 6 weeks after the attack. Three patients with a fibrinoid reaction and visual acuity of 20/50 or less had documented CME. This complication may result from the iris manipulation, and further studies are necessary to determine just what proportion of patients with any visual acuity less than 20/20 develop postoperative CME. It also remains to be determined whether prevention of a marked inflammatory reaction can reduce the incidence of CME. We were unable to determine the cause of decreased acuity in nine patients with visual acuity worse than 20/40 and cannot rule in or out the possibility that these patients suffered visual damage as a result of the acute attack, which was not evident by disc examination after IOP had been extensively lowered. Again, further experience will hopefully elucidate this situation.

Phacoemulsification offers several advantages over ECCE. Intraoperative direct gonioscopy and GSL are better performed with minimal corneal distortion and wound leak in eyes undergoing small incision cataract extraction. In addition, the temporal approach spares the superior conjunctiva for future filtering surgery if needed. In conclusion, combined phacoemulsification, PCIOL implantation, and goniosynechialysis is effective in reducing PAS and IOP in eyes with persistent PAS and uncontrolled IOP in patients who had initially presented with acute ACG.

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## Discussion
## by
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What options do we have for the treatment of primary angle-closure glaucoma (PACG)? We can do phacoemulsification with or without goniosynechialysis (GSL). We can perform a trabeculectomy with or without mitomycin, and we can perform a combined procedure of phacoemulsification and trabeculectomy.

The article by Teekhasaenee and Ritch deals with a selected group of patients with acute primary angle-closure glaucoma (APACG), all of whom had a recent attack of glaucoma and peripheral anterior synechiae of more than 180°. All had a peripheral iridectomy and a peripheral iridoplasty. Still, after these procedures, their intraocular pressure (IOP) was uncontrolled with medical treatment. The study does not deal with longstanding APACG nor with chronic PACG. This article also does not deal with the question of whether the presence of a visual field defect should influence one's management decision.

The authors propose that a phaco-GSL has advantages over trabeculectomy. It is not a comparative study, and thus we have no data on the comparison of phacoemulsification alone versus trabeculectomy in such patients nor do we know what the additional value is of GSL versus phacoemulsification alone.

In the absence of a comparative study, what information do we have? In 1991, Gunning and I[1] published data on the effect of extracapsular cataract extraction without GSL in patients with ACG. Recent long-term follow-up of 52 months showed an IOP change from 28 mmHg before surgery to 17 mmHg after surgery (meds from 2.3 before surgery to 1.3 after surgery) in subacute or chronic PACG after clear lens extraction alone[3]). We suggested that cataract extraction in many cases of ACG may have advantages over trabeculectomy.[1,2] Based on recent literature, it may well be that the results of phacoemulsification are even better than those of extracapsular cataract extraction. In the absence of a comparative study, we can compare the potential advantages of phacoemulsification plus GSL over trabeculectomy (Table 1). It seems that the postoperative IOP is in the same range for both procedures. Fibrinous reactions may occur after acute attacks of angle closure whether the procedure is a phacoemulsification or a trabeculectomy. Hyphemas may occur in both procedures. Iridodialysis was not reported in the current series. Intraocular pressure spikes are probably more likely to occur after phaco-GSL. In our experience, however, this should not be a problem when the patient is routinely controlled some hours after the operation. This pressure spike can be treated by several simple techniques. We have not found a deleterious effect on the visual field when the pressure spikes are appropriately treated. The well-known complications of a trabeculectomy with fibrosis inhibitor (e.g., thin bleb, bleb leak, blebitis, flat anterior chamber, and hypotony) of course do not occur after phaco-GSL. There is the additional risk of malignant glaucoma after trabeculectomy in cases of ACG.

If a trabeculectomy is done first, there is a 20% chance of permanent IOP increase after cataract extraction. In our own studies, the visual acuity results were more satisfactory after cataract extraction (same or improved) than after trabeculectomy.

A more important reason for preferring phaco-GSL over trabeculectomy is because the cause of ACG is an anatomic condition. By removing the lens, we potentially eliminate the cause of ACG. Whether this procedure will be effective depends on the damage that has been done during the angle closure. This will most probably depend on the extent, duration, and intensity of the angle closure. Of course, recent iris apposition with subsequent increase of IOP has a much better prognosis than longstanding peripheral anterior synechia. Permanent damage to the trabecular meshwork may occur in the latter situation. This also raises the question of how well we can differentiate between temporary iris apposition and permanent closure. However, there seem to be good reasons for the choice of lens extraction (using a corneal approach) over trabeculectomy, and a trabeculectomy can always be done in the small percentage of cases in which the lens extraction fails to control IOP. The trabeculectomy can then be performed in the safer situation of pseudophakia (deep anterior chamber).

Do we know the extra effect of GSL over phacoemulsification? Again, in the absence of a comparative study on the effect of

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Table 1. Potential Advantages of Phacoemulsification plus GSL over Trabeculectomy

| | Phaco-GSL | TE-MMC |
|---|---|---|
| Postop IOP | 13 | 10–13 |
| Fibrinous reaction | ± | ± |
| Hyphema | ± | ± |
| Iridodialysis | − | − |
| IOP spike | ++ | + |
| Thin bleb, leak | − | ± |
| Blebitis | − | ± |
| Flat AC | − | ± |
| Hypotony | − | 1–5% |
| Malignant glaucoma | − | + |

GSL = goniosynechialysis; TE = trabeculectomy; MMC = mitomycin C; IOP = intraocular pressure; AC = anterior chamber.

phacoemulsification with and without GSL, we have to find other proof. These authors claim that there is a relation between the extent of synechiae and the amount of pressure reduction. We can confirm this.[3] We also know from other studies that goniosynechialysis alone may have some effect on IOP in ACG. The chance of recurrence of PAS is, however, greater when the lens is still in place. The success of goniosynechialysis in pseudophakic eyes is twice that of the success rate in phakic eyes. Even though these data render an extra effect of GSL probable, it is not proof. A comparative study would be of interest. Based on the information available currently, how do we manage acute PACG in those patients who still have a raised IOP while taking medication after peripheral iridectomy or iridoplasty?

Considerations here are the time lapse after the attack, extent of PAS, visual acuity, and visual field defect. The current authors recommend performing phaco-GSL at 6 weeks after the attack. They do not mention the status of the visual acuity or of the visual field. Sixteen of their eyes had a visual acuity between 20/20 and 20/40. If we want to change the anatomic situation, this may have to be done irrespective of visual acuity. We would like to suggest that even after a longer postattack period, it would still be worthwhile to perform phacoemulsification first. As has been said before, a trabeculectomy can always be done at a later stage.

Combined phacotrabeculectomy should perhaps be reserved for extensive, longstanding synechial closure with substantial visual field defects. Again, late trabeculectomy has advantages, particularly when the eye is more quiet and pseudophakic. Given the current evidence, there seems to be little indication for trabeculectomy alone.

**References**

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