



Controversies in Angle Closure Glaucoma Treatment

By

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Controversies in Angle Closure Glaucoma Treatment

Controversies in AACG Treatment

Controversies in CACG Treatment

Controversies in AACG Treatment

LPI alone Vs LPI & ALPI

ALPI Vs GT after LPI failure

Phaco Vs LPI after AACG abortion



- **Conclusions:**
- 1. In eyes with PACG, both iridotomy alone or combined with iridoplasty provide a significant and **equivalent** reduction in IOP.
- 2. There is a possible reduction in peripheral anterior synechiae, more so in the **iridoplasty** group.

Laser Peripheral Iridotomy With and Without Iridoplasty for Primary Angle-Closure Glaucoma: 1-Year Results of a Randomized Pilot Study

SHI SUN, YUAN HAO HANG, HANG LI HANG, SU BEI PAN, JIAN PINGSON, XI ZHEN LI, AND WEN RUI LI

OBJECTIVE: To compare the efficacy and safety of laser peripheral iridotomy with or without laser peripheral iridoplasty in the treatment of acute angle-closure and chronic angle-closure or primary angle-closure glaucoma.

DESIGN: Randomized controlled clinical trial.

SETTING: Comprehensive glaucoma center.

PATIENTS: Comprehensive glaucoma center (over 40 years old) with confirmed primary angle-closure or primary angle-closure glaucoma were recruited. Eighty patients were randomized to 1 of 2 treatment options: iridotomy or iridotomy plus iridoplasty, and were followed up for 1 year. Main outcome measures were intraocular pressure (IOP), peripheral anterior synechiae (PAS), and visual field (VF) loss and quality of life.

RESULTS: In each group, over 177 patients were randomized to the iridotomy group and 167 were randomized to the iridotomy plus iridoplasty group. Mean age was 63.7 ± 11.2 years in the iridotomy and 63 patients (60.2%) from the iridotomy plus iridoplasty group had a history of PAS. There were no significant differences between the groups in the baseline IOP, VF, or PAS. At 1 year, the IOP was 15.0 ± 2.0 mm Hg in the iridotomy plus iridoplasty group ($P < .001$) and mean VF was 17.0 ± 1.5 dB and PAS was 0.2 ± 0.1. There was a significant difference between the groups in the baseline IOP ($P < .001$) and mean VF was 17.0 ± 1.5 dB and PAS was 0.2 ± 0.1. There was no significant difference in IOP, VF, or PAS between the groups at the 1-year visit.

CONCLUSIONS: In eyes with confirmed primary angle-closure or primary angle-closure glaucoma, both iridotomy alone or combined with iridoplasty provide a significant and equivalent reduction in IOP. There is also a possible reduction in peripheral anterior synechiae.

ALPI Vs GT after LPI failure

- **Conclusions:**
- After 1 year, ALPI was associated with higher failure rates and lower IOP reduction compared with Prostaglandin therapy in eyes with **persistent** appositional angle closure and raised IOP after LI.

Argon Laser Peripheral Iridoplasty for Primary Angle-Closure Glaucoma
A Randomized Controlled Trial

Ann Intern Med. 2014;160(12):803-810. doi:10.7554/aim.12003

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OBJECTIVE: To determine the effectiveness of argon laser peripheral iridoplasty (ALPI) in primary angle-closure glaucoma (PACG) and primary angle-closure glaucoma (PACG).

DESIGN: Randomized controlled trial.

SETTING: Comprehensive glaucoma center.

PATIENTS: Eighty PACG or PACG subjects who underwent laser iridotomy 18 to 24 hours after laser peripheral iridotomy (LPI) and had a mean IOP of 21 mmHg or higher at 1 month after LPI.

MEASUREMENTS AND MAIN RESULTS: Subjects were randomized to receive either ALPI (ALPI group) or prostaglandin therapy (PACG group). The ALPI group was followed up for 1 year. The PACG group was followed up for 1 year. The ALPI group was followed up for 1 year. The PACG group was followed up for 1 year. The ALPI group was followed up for 1 year. The PACG group was followed up for 1 year.

CONCLUSIONS: After 1 year, ALPI was associated with higher failure rates and lower IOP reduction compared with PTA therapy in eyes with persistent appositional angle closure and raised IOP after LPI.



- **Conclusions:**

1. Early phaco. appeared to be **more effective** in preventing IOP rise than LPI in patients after abortion of APAC.
2. High presenting IOP of **55 mmHg** is an added risk factor for subsequent IOP rise

Randomized Trial of Early Phacoemulsification versus Peripheral Iridotomy to Prevent Intraocular Pressure Rise after Acute Primary Angle Closure

Dennis S. C. Lam, MD, FRCOphth,¹ Oscar Y. L. Loong, FRCO, DRCOphth,¹ Cheng C. Y. Tham, FRCO,² Felix C. H. Li, MBChB,¹ Jyotsna Y. S. Awong, MBChB,¹ Thomas Y. H. Chan, FRCO,² Dorothy C. F. Fan, FRCO²

Purpose: To compare the efficacy of early phacoemulsification versus laser peripheral iridotomy (LPI) in the prevention of intraocular pressure (IOP) rise in patients after acute primary angle closure (APAC).

Design: Prospective randomized controlled trial.

Participants: Sixty-two eyes of 32 Chinese subjects, with 37 eyes in each arm.

Methods: Subjects were randomized to receive either early phacoemulsification or LPI after aborting APAC by medications. Patients were followed up on day 1, week 1, and months 1, 3, 6, 12, and 18. Predictors for IOP rise were studied.

Main Outcome Measures: Prevalence of IOP rise above 21 mmHg (primary) and number of glaucoma medications, IOP, and Shaffer gonioscopy grading (secondary).

Results: Prevalences of IOP rise for the LPI group were 16.7%, 32.3%, 41.9%, and 48.7% for the follow-up at 3, 6, 12, and 18 months, respectively. There was only one eye (2.4%) in the phacoemulsification group that had IOP rise at all follow-up time points ($P < 0.0001$). Treatment by LPI was associated with significantly increased hazard of IOP rise (hazard ratio [HR], 14.9; 95% confidence interval [CI], 1.8–142.2; $P = 0.008$). In addition, a maximum IOP at presentation > 55 mmHg was associated with IOP rise (HR, 4.1; 95% CI, 1.3–13.2; $P = 0.017$). At 18 months, the mean number of medications required to maintain IOP ≤ 21 mmHg was significantly higher in the LPI group (0.86 \pm 1.14) than in the phacoemulsification group (0.52 \pm 0.76; $P = 0.002$). Mean IOP for phacoemulsification group (2.0 \pm 1.9 mmHg) was consistently lower than that of the LPI group (5.0 \pm 3.4 mmHg; $P = 0.009$). Mean Shaffer grading for the phacoemulsification group (2.13 \pm 0.78) was consistently greater than that of the LPI group (0.72 \pm 0.64; $P = 0.0001$).

Conclusions: Early phacoemulsification appeared to be more effective in preventing IOP rise than LPI in patients after abortion of APAC. High presenting IOP of > 55 mmHg is an added risk factor for subsequent IOP rise. For patients with coexisting cataract and presenting IOP of > 55 mmHg, early phacoemulsification can be considered as a definitive treatment to prevent IOP rise. *Ophthalmology* 2008;115:1134–1140 © 2008 by the American Academy of Ophthalmology.



- 3. The optimal timing for performing phaco. is **yet unclear**. It would be optimal to have the phaco done after the eye has become quiet but before the setting in of significant PAS with or without IOP rise.

Randomized Trial of Early Phacoemulsification versus Peripheral Iridotomy to Prevent Intraocular Pressure Rise after Acute Primary Angle Closure

Dennis S. C. Lam, MD, FRCOphth,¹ Oscar Y. L. Loong, FRCO, DRCOphth,¹ Cheng C. Y. Tham, FRCO,² Felix C. H. Li, MBChB,¹ Jyotsna Y. S. Awong, MBChB,¹ Thomas Y. H. Chan, FRCO,² Dorothy C. F. Fan, FRCO²

Purpose: To compare the efficacy of early phacoemulsification versus laser peripheral iridotomy (LPI) in the prevention of intraocular pressure (IOP) rise in patients after acute primary angle closure (APAC).

Design: Prospective randomized controlled trial.


Participants: Sixty-two eyes of 32 Chinese subjects, with 37 eyes in each arm.

Methods: Subjects were randomized to receive either early phacoemulsification or LPI after aborting APAC by medications. Patients were followed up on day 1, week 1, and months 1, 3, 6, 12, and 18. Predictors for IOP rise were studied.


Main Outcome Measures: Prevalence of IOP rise above 21 mmHg (primary) and number of glaucoma medications, IOP, and Shaffer gonioscopy grading (secondary).

Results: Prevalences of IOP rise for the LPI group were 16.7%, 32.3%, 41.9%, and 48.7% for the follow-up at 3, 6, 12, and 18 months, respectively. There was only one eye (2.4%) in the phacoemulsification group that had IOP rise at all follow-up time points ($P < 0.0001$). Treatment by LPI was associated with significantly increased hazard of IOP rise (hazard ratio [HR], 14.9; 95% confidence interval [CI], 1.8–142.2; $P = 0.008$). In addition, a maximum IOP at presentation > 55 mmHg was associated with IOP rise (HR, 4.1; 95% CI, 1.3–13.2; $P = 0.017$). At 18 months, the mean number of medications required to maintain IOP ≤ 21 mmHg was significantly higher in the LPI group (0.86 \pm 1.14) than in the phacoemulsification group (0.52 \pm 0.76; $P = 0.002$). Mean IOP for phacoemulsification group (2.0 \pm 1.9 mmHg) was consistently lower than that of the LPI group (5.0 \pm 3.4 mmHg; $P = 0.009$). Mean Shaffer grading for the phacoemulsification group (2.13 \pm 0.78) was consistently greater than that of the LPI group (0.72 \pm 0.64; $P = 0.0001$).

Conclusions: Early phacoemulsification appeared to be more effective in preventing IOP rise than LPI in patients after abortion of APAC. High presenting IOP of > 55 mmHg is an added risk factor for subsequent IOP rise. For patients with coexisting cataract and presenting IOP of > 55 mmHg, early phacoemulsification can be considered as a definitive treatment to prevent IOP rise. *Ophthalmology* 2008;115:1134–1140 © 2008 by the American Academy of Ophthalmology.



Phaco



LPI

- **Conclusion:**
- Performed **within 1 week** in patients with APAC and coexisting cataract, phaco/IOL resulted in lower rate of IOP failure at 2 years compared with LPI.

Initial Management of Acute Primary Angle Closure
A Randomized Trial Comparing Phacoemulsification with Laser Peripheral Iridotomy

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Objective: To compare the 2-year efficacy of phacoemulsification and trabeculectomy lens implant (phaco/IOL) with laser peripheral iridotomy (LPI) in the acute management of acute primary angle closure (APAC) and coexisting cataract.

Design: Randomized, controlled trial.

Participants: We included 37 subjects presenting with APAC who had previously received treatment for their cataract (phacoemulsification) and had received LPI within 24 hours, and had bilateral visual acuity of $\leq 20/40$.


Main Outcome Measures: The primary outcome measure was failure of LPI defined as IOP >math>21</math> mmHg (2 to 23 mmHg on 2 consecutive readings taken within 1 month) of each other in IOP ≤ 21 mmHg on 1 occasion, after receiving either study L. Secondary outcome measures were complications, degree of angle opening, amount of peripheral iridectomy, visual acuity, and corneal endothelial cell count (CECC).

Methods: Subjects were randomized to receive either LPI or phaco/IOL in the affected eye within 1 week of presentation and were assessed at first surgery and 24 months. Patients underwent a standardized examination that included Goldmann peripheral hemifield, gonioscopy, and CECC measurement. Logistic regression was used to estimate the effect of treatment on failure of LPI control. Time to failure was calculated using the Kaplan-Meier technique and Cox regression was used to estimate the median time to failure.


Results: There were 18 patients randomized to LPI and 19 to phaco/IOL. The average age of patients was 68 (range 52 to 82) years and mean IOP after treatment was 14.5 (SD 3.0) mmHg. The 2-year cumulative survival rate (P, 74% and 86.3% for the LPI and phaco/IOL groups, respectively) ($P = 0.334$). There was no change in CECC for either group from baseline to month 6. There was 1 postoperative complication in the phaco/IOL group compared with 4 in the LPI group ($P = 0.186$).

Conclusions: Performed within 1 week in patients with APAC and coexisting cataract, phaco/IOL resulted in lower rate of IOP failure at 2 years compared with LPI.

Financial Disclosures: The authors have no proprietary or commercial interest in any of the materials discussed in this article. (JAMA Ophthalmol. 2012;30(12):1124-1130. © 2012 by the American Academy of Ophthalmology.)

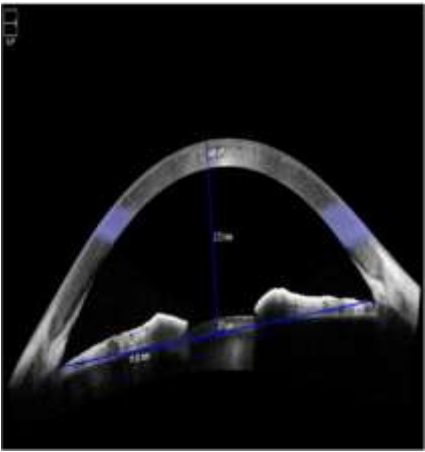



Phaco




LPI

- AS-OCT or UBM will help in showing the role of the lens in pathogenesis of the ACCG through increased **lens volume** and the **lens vault**.



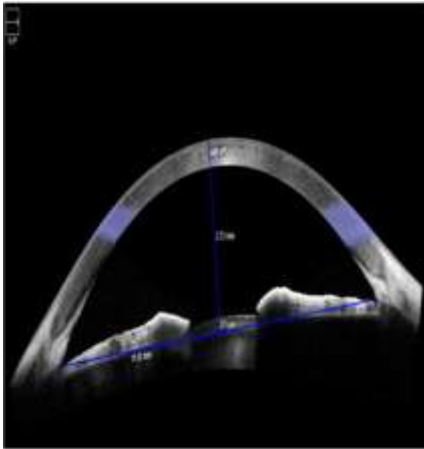



Phaco




LPI

- **Lens vaulting** is the perpendicular distance between the anterior pole of crystalline lens and a horizontal line joining the two sclera spurs on horizontal AS-OCT scans.
- The mean value of lens vaulting in angle closure was $901 \pm 265 \mu\text{m}$, and it was $316 \pm 272 \mu\text{m}$ in normal eyes.





Phaco



LPI

- Intraocular surgery in patients with angle closure is **more challenging** than regular surgery because of the shallow AC, atonic pupil from the acute attack, and residual corneal edema.


SURVEY OF OPHTHALMOLOGY VOLUME 63 NUMBER 4 APRIL 2018

MAJOR REVIEW

Angle-closure Glaucoma: The Role of the Lens in the Pathogenesis, Prevention, and Treatment

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Phaco



LPI

- The reviewed studies of lensectomy for treatment of ACG reported that lensectomy, by either ECCE or PHACO, to be potentially safe in the hands of a **skilled cataract surgeon**


SURVEY OF OPHTHALMOLOGY VOLUME 53 NUMBER 11 NOVEMBER 2014

MAJOR REVIEW


Angle-closure Glaucoma: The Role of the Lens in the Pathogenesis, Prevention, and Treatment

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Phaco



LPI

- The **complication** causing the most frequent concern was
 1. The immediate postoperative **pressure spike**, which occurred in 9–60% of eyes.

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Phaco



LPI

2. Corneal edema as endothelial cell damage is common after acute angle closure and elevated IOP

3. Significant postoperative inflammation was seen in 16--40% of eyes reported in at least four studies.

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MAJOR REVIEW

Angle-closure Glaucoma: The Role of the Lens in the Pathogenesis, Prevention, and Treatment

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Controversies in CACG Treatment

Phaco .Vs trab. in medically uncontrolled CACG without cataract

Phaco. Vs Phaco+trab. in medically controlled CACG with cataract

Phaco. Vs Phaco+trab. in medically uncontrolled CACG with cataract



- **Conclusions:**
 1. Both phaco. and trab. are effective in reducing IOP in medically uncontrolled CACG eyes **without cataract.**
 2. Trabe. is more effective than phaco. in reducing dependence on glaucoma drugs, but is associated with more complications.

Phacoemulsification versus Trabeculectomy in Medically Uncontrolled Chronic Angle-Closure Glaucoma without Cataract

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Dwan F. L. Tang, FRCO,^{1,2} Fida C. H. G. FRCO,^{1,2} Dwan S. C. Lee, FRCO, FRCOphd^{1,2,3}

Objective: To compare phacoemulsification versus trabeculectomy with adjunctive mitomycin C in medically uncontrolled chronic angle-closure glaucoma (CACG) without cataract.
Design: Prospective, randomized clinical trial.
Participants: Fifty medically uncontrolled CACG eyes without cataract of 50 patients.
Intervention: Patients were randomized into undergoing either phacoemulsification or trabeculectomy with adjunctive mitomycin C. After surgery, patients were followed up every 3 months for 2 years.
Main Outcome Measures: Intraocular pressure (IOP) and requirement for glaucoma drugs.
Results: Twenty-six CACG eyes were randomized to receive phacoemulsification, and 24 eyes underwent trabeculectomy with mitomycin C. Phacoemulsification and trabeculectomy resulted in significant and comparable IOP reduction at 24 months after surgery (reduction of 8.4 mmHg or 34% for phacoemulsification vs. 8.5 mmHg or 38% for trabeculectomy; $P = 0.76$). Over first 24 months, trabeculectomy-treated eyes required on average 1.1 fewer drugs than phacoemulsification-treated eyes ($P = 0.007$). However, trabeculectomy was associated with significantly more surgical complications than phacoemulsification (46% vs. 4%; $P = 0.007$). Eight (33%) of 24 trabeculectomy eyes demonstrated cataract during follow-up.
Conclusions: Both phacoemulsification and trabeculectomy are effective in reducing IOP in medically uncontrolled CACG eyes without cataract. Trabeculectomy is more effective than phacoemulsification in reducing dependence on glaucoma drugs, but is associated with more complications.
Financial Disclosures: The authors have no proprietary or commercial interest in any materials discussed in this article. Ophthalmology 2012;121:842-87 © 2012 by the American Academy of Ophthalmology.



- 3. Phaco. may be even more favorable in patients who are prone to, or cannot accept, the complications of trab. and mitomycin C. However, in situations where drug reduction is a high priority, trabeculectomy may be more suitable.
- 4. The surgical decision has to be based on **individual circumstances and preferences of each patient.**

Phacoemulsification versus Trabeculectomy in Medically Uncontrolled Chronic Angle-Closure Glaucoma without Cataract

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Conclusions: Both phacoemulsification and trabeculectomy are effective in reducing IOP in medically uncontrolled CACG eyes without cataract. Trabeculectomy is more effective than phacoemulsification in reducing dependence on glaucoma drugs, but is associated with more complications.
Financial Disclosures: The authors have no proprietary or commercial interest in any materials discussed in this article. Ophthalmology 2012;121:842-87 © 2012 by the American Academy of Ophthalmology.





• **Conclusions:**

1. Combined phacotrab. with adjunctive mitomycin C may be marginally more effective than phaco. alone in controlling IOP in **medically controlled** CACG eyes with coexisting cataract.
2. Combined surgery may be associated with more complications and additional surgery in the postoperative period..

Phacoemulsification Versus Combined Phacotrabeculectomy in Medically Controlled Chronic Angle Closure Glaucoma with Cataract

Chen C. Y. Tian, FRCS,^{1,2} Eshel S. Y. Eving, MRCS,^{1,2} Duan T. L. Long, FRCS,^{1,2} S. W. Lam, MRCS,^{1,2} Fu C. H. Li, MRCS,^{1,2} Tian T. H. Chu, FRCS,^{1,2} Jauhan C. H. Chen, FRCS,^{1,2} Goh H. Y. Chai, FRCS,^{1,2} Agui S. Y. Non, FRCS,^{1,2} Don W. F. Fok, FRCS,^{1,2} C. C. Yik, FRCS,^{1,2} Grossi G. Lam, FRCS, FRCSphd,^{1,2} Jerry S. M. Lu, MD, FRCSphd¹

Objective: To compare phacoemulsification alone versus combined phacotrabeculectomy in medically controlled chronic angle closure glaucoma (CACG) with coexisting cataract.
Design: Randomized clinical trial.
Participants: Seventy-four medically controlled CACG eyes with coexisting cataract.
Intervention: Recruited patients were randomized into group 1 phacoemulsification alone or group 2 combined phacotrabeculectomy with adjunctive mitomycin C. Postoperatively, subjects were reviewed every 3 months for 2 years.
Main Outcome Measures: Intraocular pressure (IOP) and requirement for topical glaucoma drugs.
Results: Thirty-five CACG eyes were randomized into group 1, and 39 CACG eyes were randomized into group 2. There were no statistically significant differences ($P < 0.05$) in mean IOP between the 2 treatment groups preoperatively and postoperatively, except at 1 month ($P = 0.001$) and 3 months ($P = 0.008$). Combined phacotrabeculectomy with adjunctive mitomycin C resulted in CDR as topical glaucoma drops ($P < 0.001$) in the 24-month postoperative period compared with phacoemulsification alone. The differences in IOP control were, however, not associated with differences in glaucoma progression. Combined surgery was associated with more postoperative ($P < 0.001$) complications compared with phacoemulsification alone.
Conclusions: Combined phacotrabeculectomy with adjunctive mitomycin C may be marginally more effective than phacoemulsification alone in controlling IOP in medically controlled CACG eyes with coexisting cataract. Combined surgery may be associated with more complications and additional surgery in the postoperative period. Further study is needed to determine whether the marginally better IOP control of combined surgery justifies the potential additional risk of complications and further surgery.
Financial Disclosure: The authors have no proprietary or commercial interest in any materials discussed in this article. *Ophthalmology* 2008;115:2167-2173 © 2008 by the American Academy of Ophthalmology.



• **Conclusions:**

1. Combined phacotrab. with adjunctive mitomycin C is more effective than phaco. alone in controlling IOP in **medically uncontrolled** CACG eyes with coexisting cataract.
2. Combined phacotrab. is associated with more postoperative complications

Phacoemulsification versus Combined Phacotrabeculectomy in Medically Uncontrolled Chronic Angle Closure Glaucoma with Cataracts

Chen C. Y. Tian, FRCS,^{1,2} Eshel S. Y. Eving, MRCS,^{1,2} Duan T. L. Long, FRCS,^{1,2} S. W. Lam, MRCS,^{1,2} Fu C. H. Li, MRCS,^{1,2} Tian T. H. Chu, FRCS,^{1,2} Jauhan C. H. Chen, FRCS,^{1,2} Duan S. C. Lam, FRCS, FRCSphd,^{1,2} Jerry S. M. Lu, MD, FRCSphd¹

Objective: To compare phacoemulsification alone versus combined phacotrabeculectomy in medically uncontrolled chronic angle closure glaucoma (CACG) with coexisting cataract.
Design: Prospective randomized clinical trial.
Participants: Fifty-one medically uncontrolled CACG eyes with coexisting cataract of 51 patients.
Intervention: Recruited patients were randomized into group 1 phacoemulsification alone or group 2 combined phacotrabeculectomy with adjunctive mitomycin C. Postoperatively, patients were reviewed every 3 months for 2 years.
Main Outcome Measures: Intraocular pressure (IOP) and requirement for topical glaucoma drugs.
Results: Twenty-seven CACG eyes were randomized into group 1, and 24 CACG eyes were randomized into group 2. Combined phacotrabeculectomy resulted in lower mean postoperative IOP than phacoemulsification alone at 3 months (14.3 vs. 17.6 mmHg, $P = 0.01$), 11 months (13.2 vs. 15.4 mmHg, $P = 0.02$), and 18 months (13.0 vs. 15.9 mmHg, $P = 0.01$). Combined phacotrabeculectomy resulted in 1.23 fewer topical glaucoma drops ($P < 0.001$) in the 34-month postoperative period, compared with phacoemulsification alone. Combined surgery was associated with more postoperative complications ($P < 0.001$) and more progression of optic neuropathy ($P = 0.03$), compared with phacoemulsification alone.
Conclusions: Combined phacotrabeculectomy with adjunctive mitomycin C is more effective than phacoemulsification alone in controlling IOP in medically uncontrolled CACG eyes with coexisting cataract. Combined phacotrabeculectomy is associated with more postoperative complications.
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