Sequential *versus* Combined Glaucoma and Cataract Procedures in Siriraj Hospital

Darin Sakiyalak, M.D., Teeravee Hongyok, M.D., Naris Kitnarong, M.D.

Department of Ophthalmology, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok 10700, Thailand.

ABSTRACT

Objective: To compare the efficacy of intraocular pressure (IOP) control after combined cataract and trabeculectomy with sequential cataract surgery after trabeculectomy, both with and without antimetabolites.

Methods: The retrospective study recruited 96 eyes of 73 patients who underwent cataract and glaucoma surgery, and were classified into two groups. Group I sequential procedures: 72 eyes of 56 patients who had undergone a previous trabeculectomy (with or without antimetabolites) for at least 6 months before planned phacoemulsification or ECCE. Groups II combined procedures: 24 eyes of 17 patients who underwent combined trabeculectomy (with or without antimetabolites) with phacoemulsification or ECCE between January 1998 and May 2003. The effects on IOP, best corrected visual acuity, and number of glaucoma medications taken were compared.

Results: Mean postoperative IOP without oral medications was 14.17 mmHg in group I and 17.15 mmHg in group II (p=0.05) at 12 month follow up. The mean IOP remained significantly lower in group I (13.67) than in group II (16.36) (p=0.023) at the last follow up. There was a significant difference in surgical success between the groups (p=0.005). The reduction in the mean number of glaucoma medications was significantly higher in group I (p=0.04). In group I the mean IOP before and after cataract surgery were similar (p=0.787) but the numbers of glaucoma medications used were significantly increased (p=0.000) after cataract surgery.

Conclusion: Sequential glaucoma and cataract procedure was associated with better IOP control than combined procedure. Cataract surgery in eyes with functioning bleb might have the adverse effect on IOP control.

Keywords: Antimetabolites; Cataract; Extracapsular cataract extraction (ECCE); Glaucoma; Intraocular pressure (IOP); Phacoemulsification; Trabeculectomy

Siriraj Med J 2006; 58: 911-915
E-journal: http://www.sirirajmedj.com

The ultimate surgical goal for patients with cataract and glaucoma should be adequate intraocular pressure (IOP) control and improved quality of life through improving vision and decreasing antiglaucoma medications.

Combined trabeculectomy with cataract surgery is more convenient and can prevent post-operative IOP elevations. On the other hand, post operative control of IOP is more effective following a trabeculectomy alone than after combined trabeculectomy with extracapsular cataract extraction (ECCE)[1,2] as well as phacoemulsification.[3-5] Although the success of bleb formation and IOP reduction is greater after trabeculectomy alone. The potential for adverse effects on bleb function after cataract removal in a preexisting functioning filtering blebs has been reported.[6,7]

In this retrospective study, after a minimum of 1 year follow up the outcome of patients underwent combined surgery were compared with sequential cataract extraction at least 6 months after trabeculectomy. We also attempted to evaluate conditions that might be the risk factors for filtering bleb failure.

MATERIALS AND METHODS

The effect on IOP after cataract extraction (both extracapsular cataract extraction and phacoemulsification) in eyes with previous trabeculectomy with or without 5-fluorouracil (5-FU) and mitomycin-C (MMC) (Group 1, N=72) were compared with those in the eyes that had combined cataract extraction and trabeculectomy, also with or without antimetabolites (Group 2, N=24).

The charts of 96 eyes of 73 patients were reviewed and divided into two groups.

Group I Sequential procedures: 72 eyes of 56 patients, who had undergone a previous trabeculectomy with or without antimetabolites for at least 6 months before

Correspondence to: Darin Sakiyalak
E-mail: sidsk@mahidol.ac.th

planned phacoemulsification or ECCE between January 1998 and May 2003 at Siriraj Hospital, Bangkok.

These eyes had no other ocular diseases and did not require oral antiglaucoma medication or further glaucoma surgery. All patients had at least 12 months of follow-up after cataract extraction.

Groups II Combined procedures: 24 eyes of 17 patients, who underwent combined trabeculectomy with phacoemulsification or ECCE with or without antimetabolites between January 1998 and May 2003 at Siriraj Hospital, Bangkok. All patients had at least 12 months of follow-up after the surgery.

Variables retrieved from patient charts included age at the time of combined or trabeculectomy surgery, gender, glaucoma diagnosis, time elapsed since trabeculectomy, IOP measured by Goldmann tonometry or Schiotz tonometry, best corrected visual acuity (BCVA), intraoperative and postoperative complications, type of antifibrotic agent used, glaucoma medications. The IOP values were recorded before each surgery and 1, 3, 6, and 12 months after surgery and at the end of follow up period. The use of glaucoma medication was reported as the number of drugs taken.

Success was defined as IOP less than 18 mmHg without oral medication or need of further surgery, phthisis bulbi, or loss of light perception.

Patients with acute, lens induced, or other secondary glaucoma were excluded. Patients who had had incisional surgery were also excluded.

Surgical techniques

Phacoemulsification

All Phacoemulsification procedures were by a clear corneal incision at temporal site. Posterior synechialysis and/or pupil stretching were performed as needed. An anterior capsulotomy was performed using a bent 27-gauge needle and/or capsulorhexis forceps. After hydrodissection, the nucleus was removed by phacoemulsification. The cortical remnants was irrigated and aspirated. A foldable acrylic posterior chamber intraocular lens (IOL) or a single piece PMMA of 5.5 mm diameter posterior chamber IOL was inserted into the capsular bag or ciliary sulcus according to capsule status. When necessary, 10-0 nylon sutures were used to close the incision. No suture or instruments were passing through the bleb.

Extracapsular cataract extraction (ECCE)

After retrobulbar anesthesia, a superior rectus traction suture was used. A fornix-based conjunctival flap and a limbal incision were created in the superior temporal quadrant avoiding the previous filtration site. Anterior capsulotomy was performed by can opening technique or capsulorhexis with relaxing incision. Nucleus was express through the wound. Residual cortex was removed by Simco I/A unit. Single piece 6.5 mm PMMA lens was implanted to posterior chamber. Wound was secured with 5-7 stitches of nylon 10-0 suture.

Trabeculectomy

We placed the 6-0 prolene traction suture through superior or supero-temporal clear cornea. Superior or supero-nasal limbal-based conjunctival incision was created. Half thickness rectangular flap of 3x3 mm dimension was created with blade no.11. Antimetabolites (MMC or 5-FU) a soaked sponge may applied under the scleral flap and subtenon space at this time according to the surgeon decision. After an optimal period of time, the sponge was removed (if used) and vigorous volume of BSS was irrigated. Paracentesis was done at the temporal site. Sclerectomy was made, with supersharp 15 degree blade and/or Kelly Descemet's punch. Peripheral iridectomy was created in all cases. Scleral flap was sutured by 2-5 stitches of 10-0 nylon. Suture tension was adjusted for optimal drainage. Conjunctiva was sutured continuously with 10-0 nylon or 10-0 biosorb sutures.

Combined procedure

Combined trabeculectomy and ECCE was performed at the same site in the superior quadrant. A superior rectus traction suture and a fornix-based conjunctival flap were used. After the half-thickness rectangular scleral flap was created, if we chose to use antimetabolites, we applied a sponge soaked in MMC or 5FU to the scleral bed beneath the flap and the surrounding sclera. After removing the sponge and irrigating the exposed area, a corneoscleral scissors were used to enlarge the scleral incision on the left and right sides of the scleral flap. After cataract extraction and lens implantation, the limbal incision on both sides of the scleral flap was closed with interrupted 10-0 nylon sutures. The scleral incision was then made at the anteriormost edge beneath the scleral flap and a Kelly Descemet's punch was used to make a sclerectomy. We created an iridectomy using the iris scissors. We closed the scleral flap with 10-0 nylon sutures and buried the knots in each free corner and sometimes in the sides if needed. The conjunctiva was closed with interrupted 10-0 nylon or 8-0 silk sutures placed at each end of the peritomy.

Combined phacotrabeculectomy was performed in the two separate sites. After placing the traction suture through the supero-temporal clear cornea, the limbal-based conjunctival incision in the supero-nasal quadrant was made. We created the half-thickness scleral flap and applied the MMC soaked sponges to the scleral bed as in a simple trabeculectomy. After the copious irrigation was done, we then moved to the side and performed the clear cornea phacoemulsification via the temporal side. After insertion of the posterior chamber intraocular lens, we aspirated viscoelastic from the eye and injected pilocarpine or miostat into the anterior chamber to constrict the pupil. We then moved back to the trabeculectomy site and performed the sclerectomy and iridectomy. The scleral-flap was then closed with 10-0 nylon of 2-5 stitches and the conjunctival wound was closed using 10-0 nylon or 10-0 biosorb continuously.

The usual postoperative treatment included prednisolone acetate, four or six times a day, for two weeks; the dosage was tapered until discontinuation after 8-12 weeks, tobramycin or quinolones four times a day for 1-2 weeks. Atropine eyedrop was used after glaucoma surgery 1-4 times a day when indicated. Postoperative subconjunctiva 5-FU was injected as needed. When the IOP increased, we intensified postoperative anti-inflammatory treatment and/or added glaucoma medications.

Statistical analysis

Comparison of IOPs, BCVA, and number of topical medications between groups were tested with Mann-Whitney U test. Chi-square analysis for 2 x 2 tables were used to compared characteristics, choice of cataract surgery, and use of antimetabolites. Wilcoxan Signed Ranks Test was used to compare preoperative and postoperative IOPs, BCVA, and number of glaucoma medications.

TABLE 1. Demographic data and characteristics in each group.

Characteristics	Number (%)	
	Group I	Group II
Number of patients	56	17
Number of eyes	72	24
Gender		
Female	40(55.6)	15(62.5)
Male	32(44.4)	9(37.5)
Glaucoma type		
Primary open angle	39(54.2)	11
Pseudoexfoliation		1 (54.2)
Pigmentary		1
Chronic closed angle	33(45.8)	11(45.8)
	Mean ± SD	
Age (years)	65.46 ± 7.91	68.00 ± 7.90
Preoperative* IOP (mmHg)	25.04 ± 8.38	27.25 ± 12.56
12 mos postoperative* IOP (mmHg)	14.17 ± 3.62	17.15 ± 5.07
Preoperative* number of glaucoma medications	2.03 ± 0.65	1.79 ± 0.50
12 mos postoperative** number of glaucoma medications	0.65 ± 0.89	0.96 ± 0.95
Follow-up (months)	48.71 ± 17.50	46.70 ± 21.28
Preoperative* BCVA (logMAR)	0.36 ± 0.34	0.80 ± 0.64
Last follow up BCVA (logMAR)	0.33 ± 0.39	0.42 ± 0.38

*Preoperative and **Postoperative indicates before trabeculectomy and after cataract procedure in group I and combined procedure in group II.

RESULTS

There were no significant differences between groups with respect to age (p= 0.114), gender (p= 0.637), diagnosis (p= 1.00), number of preoperative IOP (p= 0.826), or number of preoperative glaucoma medications (p= 0.112). The demographic data are shown in Table 1.

In group I, one patient had zonule dialysis during phacoemulsification which was not required anterior vitrectomy and IOL was placed in the bag. In group II, one patient developed hyphema intraoperatively and in the early postoperative period. Four patients with chronic closed-angle glaucoma in group I developed a flat anterior chamber suspected from aqueous misdirection after trabeculectomy required anterior chamber formation. While in group II, there was no flat anterior chamber after combined procedure recorded. None of these patients failed the criteria of success at 12 months and the final follow up. The statistical significant of intraoperative and postoperative complications was not calculated due to the small number of recorded cases.

At 12 month postoperative follow up the mean IOP was significantly higher in group II (17.15 ± 5.07) than in group I (14.17 ± 3.62) (p=0.05).

At the end of the follow-up period, the mean IOP in group I (13.674 ± 3.22) remained significantly lower than in group II (16.363 ± 3.22) (p= 0.023).

In group I, the mean IOP before cataract surgery was 14.44 ± 3.82. When compared to 14.17 ± 3.62 at 12 months after surgery (p=0.787) and 13.67 ± 3.22 (p=0.117) at last follow up, the differences were not significant. In group II the mean IOP before combined surgery was 27.25 ± 12.56 which was significantly different comparing to mean IOP at 12 month after surgery (17.15 ± 5.07) (p=0.000) and at the last follow up (16.36 ± 5.80) (p=0.000).

The mean IOP before cataract surgery in group I and combined surgery in group II followed by mean IOP at 3, 6, 12 month, and last follow up in both groups were plotted in Fig 1.

At the end of the follow up, the success rate was 90.1% (64 of 72 eyes) in group I which was significantly higher than 61.9% (13 of 24 eyes) of group II (p= 0.005).

The reduction in the mean number of glaucoma medications at the end of the follow-up period was significantly higher in group I (p= 0.04).

In group I, the numbers of glaucoma medications used were significantly higher at 12 months after cataract surgery when compared to before cataract surgery (p= 0.000).

At the last follow up, BCVA in group I (log MAR= 0.327 ± 0.39) was not significantly difference from group II (0.418 ± 0.38) (p=0.1). But the mean BCVA improvement (first visit and last follow up) was better in group II (0.804 ± 0.64 to 0.4188 ± 0.381; p= 0.002) compared to group I (0.363 ± 0.34 to 0.327 ± 0.39; p= 0.036).

Antimetabolites were used in failure group 21.4% (3 eyes) and success group 22% (18 eyes).

And we found that antimetabolites use during trabeculectomy had no effect on the propensity of failure (odds ratio=0.984; 95%CI = 0.244-3.962) (p=1.00).

There were 92 of 96 eyes from which we were able to collect the information of lens surgery. Among them ECCE were performed in 13 eyes; 10 eyes in the success group (76.9%) and 3 eyes in the failure group (23.1%). Phacoemulsification were performed in 79 eyes: 69 eyes in the success group (87.3%) and 10

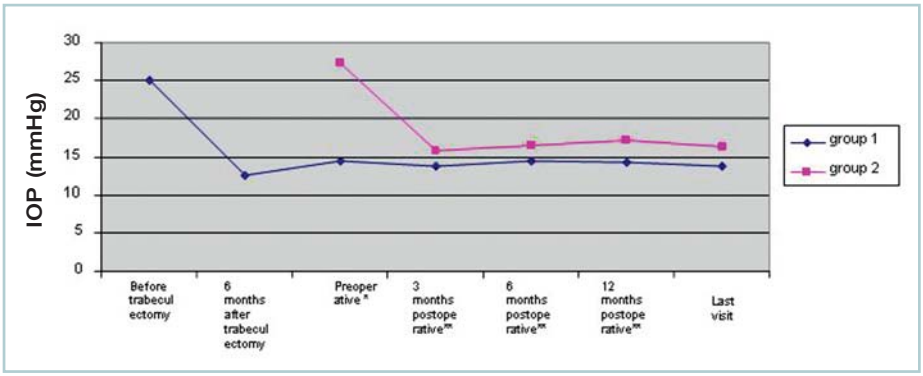

Fig 1. Preoperative and postoperative mean intraocular pressure (mmHg). Group I = sequential procedure, Group II = combined precedure.

eyes the failure group (12.7%).

When ECCE was performed the risk of failure was not higher than phacoemulsification (odds ratio = 2.1; 95%CI=0.48-8.8) (p=0.386).

DISCUSSION

A glaucoma patient with reduced vision and cataract presents an interesting challenge. The appropriate therapeutic decision depends on whether the reduction of vision is due to the presence of cataract or progression of the glaucoma. Other factors that influenced the surgical decision included: medical compliance, side effects, and cost, as well as preoperative condition of conjunctiva and anterior segment. Several studies have reported that ECCE[6,8] and phacoemulsification[9-11] after glaucoma filtering surgery may result in higher IOP and bleb failure.

This retrospective study compared the procedures on sequential versus combined glaucoma and cataract in order to find out whether there was a difference in IOP control between the techniques.

In our study, both groups had similar preoperative IOP and number of preoperative medications. The preoperative BCVA was significantly worse in the combined group but at the last follow up the between-group difference was not statistically significant. This result suggested more advanced stage of cataract preoperatively in group II. Thus, the surgeon performed the combined procedure when glaucoma surgery was needed to control the IOP.

In this study, we reported a statistically significant reduction in IOP and the number of glaucoma medications when compared between before any surgery and after the last surgery for at least 12 months in both groups. However, the mean IOP at 12-month and last follow up was significantly lower in the sequential procedure group than in the combined group. The finding is different from that reported in the study of Donoso and Rodriguez[12], in which combined cataract and glaucoma surgery with intraoperative 5-FU was associated with good long-term IOP control similar to that after phacoemulsification with intraoperative 5-FU in eyes with previous trabeculectomy.[13]

Different results on the effects of cataract surgery on filtering blebs have been reported. Caprioli et al.[14] and Park et al.[15] found that clear cornea phacoemulsification does not affect the long-term IOP control in eyes with filtering bleb. Whereas Wygnanski-Jaffe et al.[8] and Rebolleda et al.[7] found that cataract extraction through corneal incisions in patients with functioning filtering blebs is followed by an increase in IOP. In our study, the mean IOP before and after cataract surgery in group I patients was not significantly different at 12-month-postoperative and last follow up with the p value of 0.787 and 0.117, respectively. However, the numbers of glaucoma medications needed to control the IOP increased significantly at 12 months after cataract surgery in group I patients (p=0.000).

In terms of surgical success, using the criteria that we set sequential procedure had a better outcome (p=0.005). The reason behind this is, however, not clear but it may involve increased inflammation, added surgical manipulation, and the presence of lens protein in combined surgery.

The long-term IOP control of combined surgery with the use of antimetabolites is controversial.[16-18] In this study, the use of intraoperative MMC or intraoperative and postoperative 5-FU did not affect the surgical outcomes. But the difference may not be significant due to the small number of cases using antimetabolites (21 of 96 eyes; 18 in success group and 3 in failure group). In addition, if the lower target pressure or more strict criteria for success had been used we might have seen the significant difference of the outcomes between groups.

Contrary to previous reports, the choice of cataract surgery was not associated with failure. Combined phacotrabeculectomy was found to have better IOP control and a reduced need for glaucoma medications than the ECCE-trabeculectomy in many prospective[13] and retrospective studies.[19,20]

Patients recruited in our study were different from previous reports in which most of the patients were diagnosed of primary open angle glaucoma. Our study consisted of 45.8% of angle closure glaucoma in each group. Retrospectively, we found 4 cases of flat anterior chamber from aqueous misdirection after trabeculectomy in group I while there was none in group II. This suggested the advantage of combined procedure over trabeculectomy alone in sequential procedure when operated on angle closure glaucoma patients.

In conclusion, our results indicate that sequential cataract surgery after trabeculectomy is more effective in IOP control than combined surgery. And performing cataract surgery after successful trabeculectomy may adversely affect the efficacy of IOP control.

REFERENCES

1. Naveh N, Kottass R, Glovinsky J, Blumenthal M, Bar-Seven D. The long-term effect on intraocular pressure of a procedure combining trabeculectomy and cataract surgery, as compared with trabeculectomy alone. Ophthalmic Surg 1990;21:339-45.
2. Yu CB, Chong NH, Caesar RH, Boodhoo MG, Condon RW. Long-term results of combined cataract and glaucoma surgery versus trabeculectomy alone in low-risk patients. J Cataract Refract Surg 1996;22:352-7.
3. Bellucci R, Perfetti S, Babighian S, Morselli S, Bonomi L. Filtration and complications after trabeculectomy and after phaco-trabeculectomy. Acta Ophthalmol Scand 1997;(Suppl 224):44-5.
4. Caprioli J, Park HJ, Weitzman M. Temporal corneal phacoemulsification combined with superior trabeculectomy: a controlled study. Trans Am Ophthalmol Soc 1996;94:451-63; Discussion 63-8.
5. Derick RJ, Evans J, Baker ND. Combined phacoemulsification and trabeculectomy versus trabeculectomy alone: a comparison study using mitomycin-C. Ophthalmic Surg Lasers 1998;29:707-13.
6. Chen PP, Weaver YK, Budenz DL, Feuer WJ, Parrish RK. 2nd eds. Trabeculectomy function after cataract extraction. Ophthalmology 1998;105:1928-35.
7. Rebolleda G M-NF. Phacoemulsification in eyes with functioning filtering blebs: a prospective study. Ophthalmology 2002;109:2248-55.
8. Wygnanski-Jaffe T, Barak A, Melamed S, Glovinsky Y. Intraocular pressure increments after cataract extraction in glaucomatous eyes with functioning filtering blebs. Ophthalmic Surg Lasers 1997;28:657-61.
9. Crichton AC, Kirker AW. Intraocular pressure and medication control after clear corneal phacoemulsification and AcrySof posterior chamber intraocular lens implantation in patients with filtering blebs. J Glaucoma 2001;10:38-46.
10. Seah SK, Jap A, Prata JA, Baerveldt G, Lee PP, Heuer DK, Minckler DS. Cataract surgery after trabeculectomy. Ophthalmic Surg Lasers 1996;27:587-94.
11. Manoj B, Chako D, Khan MY. Effect of extracapsular cataract extraction and phacoemulsification performed after trabeculectomy on intraocular pressure. J Cataract Refract Surg 2000;26:75-8.
12. Donoso R, Rodriguez A. Combined versus sequential phacotrabeculectomy with intraoperative 5-fluorouracil. J Cataract Refract Surg 2000;26:71-4.
13. Bobrow JC. Prospective intrapatient comparison of extracapsular cataract extraction and lens implantation with and without trabeculectomy. Am J Ophthalmol 2000;129:291-6.
14. Caprioli J, Park HJ, Kwon YH, Weitzman M. Temporal corneal phacoemulsification in filtered glaucoma patients. Trans Am Ophthalmol Soc 1997;95:153-67; Discussion 67-70.
15. Park HJ, Kwon YH, Weitzman M, Caprioli J. Temporal corneal phacoemulsification in patients with filtered glaucoma. Arch Ophthalmol 1997;115:1375-80.

16. Hennis HL, Stewart WC. The use of 5-fluorouracil in patients following combined trabeculectomy and cataract extraction. Ophthalmic Surg 1991;22:451-4.
17. Shin DH, Simone PA, Song MS, Reed SY, Juzych MS, Kim C, Hughes BA. Adjunctive subconjunctival mitomycin C in glaucoma triple procedure. Ophthalmology 1995;102:1550-8.
18. Joos KM, Bueche MJ, Palmberg PF, Feuer WJ, Grajewski AL. One-year follow-up results of combined mitomycin C trabeculectomy and extracapsular cataract extraction. Ophthalmology 1995;102:76-83.
19. Tezel G, Kolker AE, Kass MA, Wax MB. Comparative results of combined procedures for glaucoma and cataract: I. Extracapsular cataract extraction versus phacoemulsification and foldable versus rigid intraocular lenses. Ophthalmic Surg Lasers 1997;28:539-50.
20. Shingleton BJ, Jacobson LM, Kuperwaser MC. Comparison of combined cataract and glaucoma surgery using planned extracapsular and phacoemulsification techniques. Ophthalmic Surg Lasers 1995;26:414-9.

บทคัดย่อ

เปรียบเทียบผลของการผ่าตัดรักษาต้อหินและต้อกระจก แยกครั้งกันและการผ่าตัดในครั้งเดียวกันของโรงพยาบาลศิริราช

ดารินทร์ สากิยลักษณ์ พ.บ., ธีรวีร์ หงษ์หยก พ.บ., นริศ กิจณรงค์ พ.บ.

ภาควิชาจักษุวิทยา, คณะแพทยศาสตร์ศิริราชพยาบาล, มหาวิทยาลัยมหิดล, กทม. 10700, ประเทศไทย

วัตถุประสงค์: เพื่อเปรียบเทียบประสิทธิภาพการควบคุมความดันตาภายหลังการผ่าตัด ระหว่างการผ่าตัดรักษาต้อหินและต้อกระจกในครั้งเดียวกัน กับการผ่าตัดรักษาต้อกระจกภายหลังการผ่าตัดรักษาต้อหิน ทั้งที่ใช้และไม่ใช้สารต้านพังผืด

วิธีการ: เก็บรวบรวมข้อมูลผู้ป่วยที่ได้รับการผ่าตัดต้อหินและต้อกระจกที่ โรงพยาบาลศิริราช ตั้งแต่มกราคม 2541 จนถึงพฤษภาคม 2546 (จำนวน 96 ตา ในผู้ป่วย 73 คน) ข้อมูลแบ่งเป็น 2 กลุ่ม กลุ่มที่ 1 (จำนวน 72 ตา ในผู้ป่วย 56 คน) ได้รับการผ่าตัดรักษาต้อหิน ก่อนผ่าตัดรักษาต้อกระจกอย่างน้อย 6 เดือน กลุ่มที่ 2 (จำนวน 24 ตา ในผู้ป่วย 17 คน) ได้รับการผ่าตัดรักษาต้อหินและต้อกระจกในครั้งเดียวกัน ผลของความดันตา การมองเห็น และจำนวนยาที่ใช้ในแต่ละกลุ่มจะถูกนำมาเปรียบเทียบกัน

ผลการศึกษา: ค่าเฉลี่ยความดันตาที่ 12 เดือนหลังการผ่าตัด ในกลุ่ม 1 คือ 14.17 มิลลิเมตรปรอทต่ำกว่ากลุ่ม 2 คือ 17.15 มิลลิเมตรปรอท (p=0.05) และค่าเฉลี่ยความดันตาที่การตรวจครั้งสุดท้าย ในกลุ่ม 1 คือ 13.67 มิลลิเมตรปรอท ยังต่ำกว่ากลุ่ม 2 คือ 16.26 มิลลิเมตรปรอท อย่างมีนัยสำคัญทางสถิติ (p=0.023) เมื่อเปรียบเทียบจำนวนผู้ป่วยในสองกลุ่มที่การตรวจครั้งสุดท้าย ผู้ป่วยที่การผ่าตัดประสบความสำเร็จในกลุ่ม 1 พบมากกว่ากลุ่มที่ 2 (p=0.005) รวมถึงจำนวนยาที่ใช้ลดลงในกลุ่ม 1 มากกว่า (p=0.04) ทั้งนี้การผ่าตัดต้อกระจกในกลุ่ม 1 ไม่ทำให้มีการเปลี่ยนแปลงผลของความดันตาเฉลี่ย (p=0.787) แต่พบว่าหลังผ่าตัดต้อกระจกมีการใช้ยาลดความดันตาเพิ่มขึ้นอย่างมีนัยสำคัญทางสถิติ (p=0.000)

สรุป: การผ่าตัดรักษาต้อกระจกภายหลังการผ่าตักรักษาต้อหิน ให้ผลการควบคุมความดันตาดีกว่าการผ่าตัดรักษาต้อหินและต้อกระจกในครั้งเดียวกัน การผ่าตัดรักษาต้อกระจกในตาที่ได้รับการผ่าตัดรักษาต้อหินมาก่อน อาจทำให้ประสิทธิภาพในการควบคุมความดันตาลดลง