THE OUTCOME OF 2.3 mm INCISION COMBINED PHACOEMULSIFICATION, TRABECULECTOMY AND LENS IMPLANTATION OF NON-FOLDABLE INTRAOCULAR LENSES

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SUMMARY

We report the results of 100 eyes in 88 patients that underwent combined phacoemulsification and implantation of non-foldable intraocular lenses (IOLs) following enlargement of the initial 2.3 mm opening and trabeculectomy. Intraocular pressure (IOP) control (<21 mmHg) was attained in 96% of the eyes. Visual acuity of 6/12 or better was attained in 76% of the eyes. A filtering bleb was absent in only 11% of the eyes. All these outcomes were favourable compared with previously reported series in which foldable IOLs were inserted without enlargement of the initial trabeculectomy openings. We conclude that the combination of small-incision cataract surgery and trabeculectomy with implantation of non-foldable IOLs is a successful surgical approach for visual rehabilitation and glaucoma control in patients with concurrent cataract and glaucoma.

Combined surgery for cataract and glaucoma has been widely practised since the mid 1970s.[1–3] Many studies have shown the benefits of combined cataract extraction and trabeculectomy in patients with coexisting cataract and glaucoma in terms of visual recovery and glaucoma control.[4,5]

Phacoemulsification has increased rapidly in popularity amongst ophthalmologists in recent years.[6] The procedure combined with trabeculectomy has been shown to promote rapid visual recovery and glaucoma control.[7,8] Some studies have indicated that phacoemulsification with implantation of foldable intraocular lenses (IOLs) through the trabeculectomy opening without enlarging the incision produces less trauma and post-operative inflammation, consequently reducing filtering bleb failure.[7]

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This retrospective study reports the results of combined phacoemulsification, trabeculectomy and implantation of non-foldable IOLs following enlargement of the initial 2.3 mm opening.

PATIENTS AND METHODS

Between March 1994 and July 1995, 100 consecutive eyes of 88 patients had combined phacoemulsification, trabeculectomy and lens implantation of non-foldable polymethylmethacrylate (PMMA) 5 mm optic IOLs through enlarged 2.3 mm incisions. Patients chosen for combined surgery had cataract that affected vision significantly and glaucoma at various stages. The patients had ophthalmoscopic evidence of glaucomatous optic nerve damage; visual field loss consistent with glaucoma such as paracentral nasal scotoma, temporal wedge loss, nasal steps, arcuate scotoma with or without peripheral breakthrough; or intraocular pressure (IOP) higher than 22 mmHg while on various anti-glaucoma medications. Seven patients had undergone previous trabeculectomy and 2 patients had undergone previous laser trabeculectomy.

Pre-operatively, all patients had recordings of best corrected visual acuity, applanation tonometry, gonioscopy and visual field testing. Pre-operative IOP was determined as the average of the last two applanation tonometry measurements before surgery.

All patients were operated on under local anaesthesia by the same surgeon (P.S.P.). A fornix-based conjunctival flap was created. The area chosen for the drainage site was treated with light surface cautery. A straight 2.3 mm partial-depth incision 2.0 mm posterior to the limbus was made with a 15° blade. A Beaver blade was then used to shelve the incision anteriorly, creating a scleral tunnel. A stab incision was made with a 15° blade through clear

cornea. A 2.3 mm keratome blade was used to enter the anterior chamber at the corneal side of the scleral tunnel. A continuous circular capsulotomy under sodium hyaluronate was followed by hydrodissection and bimanual phacoemulsification of the nucleus. Once cortex aspiration was complete, the initial opening was enlarged to 5 mm and a non-foldable 5 mm optic PMMA IOL implanted in the capsular bag.

Then, a 1.5 mm × 4 mm deep block of corneo-scleral tissue was excised, compromising the floor of the scleral tunnel. Peripheral iridectomy was performed. The viscoelastic substance was then thoroughly evacuated and acetylcholine added. The enlarged external scleral incision was secured using a 10-0 nylon figure-of-eight suture. The conjunctiva was reapposed at the limbus using a 10-0 nylon suture. Finally, balanced salt solution was injected via the corneal stab incision. None of the patients received subconjunctival injections of an antimetabolite.

Post-operatively, all patients received the same topical steroid–antibiotic combination. Patients were examined on the first day and then according to their clinical appearance at 10–14 days, 2–4 months and every 6 months thereafter. At each visit, visual acuity, IOP, anti-glaucoma medication and slit lamp observations were recorded. Special attention was paid to the anterior chamber reactions and the presence of filtering blebs. At the most recent follow-up examination, best corrected visual acuity, IOP, anti-glaucoma medications, visual field test changes and slit lamp observations were noted. Findings from the most recent follow-up examination were used for statistical analysis of IOP control.

With regard to the statistical analysis of the pre-operative and post-operative IOP data, it was felt appropriate to use a distribution-free method. The Wilcoxon rank sum test was employed to determine the significance value for the difference between pre-operative and post-operative IOP.

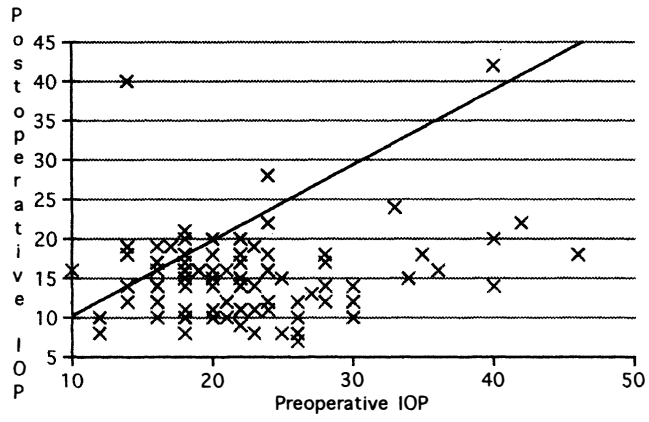

Fig. 1. *Scattergram comparing pre-operative and post-operative intraocular pressure (IOP). The continuous line indicates no change in IOP; values below the line show improvement in the IOP post-operatively.*

Table I. Anti-glaucoma medication used by the patients pre-operatively and post-operatively

No. of medications	Pre-operative	Post-operative
0	5	86
1	46	10
2	35	4
3 or more	14	0

RESULTS

Ninety-seven eyes had primary open-angle glaucoma, and 3 eyes had chronic angle-closure glaucoma. One patient died during the study period. Twenty-nine patients were male. Follow-up ranged from 6 to 18 months (mean 11.1 months).

The differences between pre-operative and post-operative IOPs in these eyes were highly statistically significant ($p<0.001$). Fig. 1 shows a scattergram comparing pre-operative IOP with post-operative IOP. The majority of eyes showed an improvement in IOP control post-operatively. The mean IOP pre-operatively was 22.7 mmHg, which reduced to 15.1 mmHg post-operatively. Over the follow-up period 96 of 100 eyes had IOP of less than or equal to 21 mmHg.

The mean medication index pre-operatively was 1.6, which reduced to 0.13 post-operatively. The numbers of anti-glaucoma medications before and after surgery are shown in Table I. Of the total 100 eyes, only 5 (5%) were on no anti-glaucoma medication pre-operatively, compared with 86 eyes (86%) which were on no medication for IOP control at the most recent follow-up examination post-operatively. Fig. 2 shows the percentage of eyes requiring post-operative glaucoma medication compared with pre-operative levels. None of the eyes required more anti-glaucoma medication post-operatively compared with pre-operative levels.

Of the total of 100 eyes, visual acuity increased in 87 and was unchanged in 7 post-operatively. Deterioration of vision post-operatively was noted in 6 eyes. Decrease in vision was caused by an expulsive haemorrhage in 1 eye, central retinal vein/branch vein occlusions in 2 eyes, macular degeneration in 2 eyes and progressive optic disc atrophy in 1 eye.

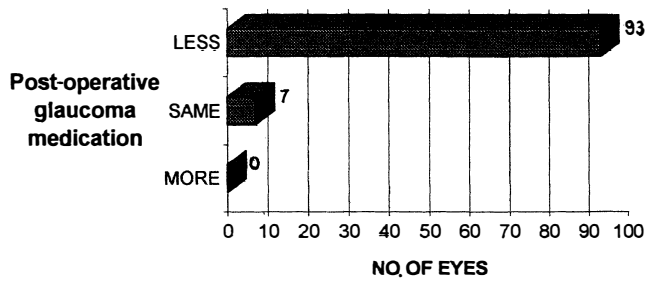

Fig. 2. *Percentage of eyes requiring post-operative medication relative to pre-operative levels.*

Table II. Post-operative complications

Complications	No. of eyes (%)
Fibrin effusion	4 (4)
Hyphaema	5 (5)
Hypotony (<5 mmHg)	8 (8)
Shallow anterior chamber	8 (8)
Choroidal detachments	3 (3)
Intraocular pressure spike (>24 mmHg)	6 (6)
Posterior capsule opacification	8 (8)
Cystoid macular oedema	2 (2)
Expulsive haemorrhage	1 (1)

Overall, 76% of eyes achieved a visual acuity 6/12 or better.

Visual field testing post-operatively revealed worsening of visual fields in 4 patients: 2 with venous occlusions, 1 with progressive optic atrophy and 1 patient with disciform macular degeneration. No increase in optic disc cupping was noted during the follow-up period.

Table II lists all early and late post-operative complications. The most frequent early post-operative complications were hypotony (IOP <5 mmHg), shallow anterior chambers, fibrin effusions and small hyphaemas. All complications were managed without additional surgery except in 1 case, in which resuturing of the wound was performed. The most common late complication was posterior capsular opacification; in all cases best corrected visual acuity returned to post-operative levels after neodymium: YAG (Nd:YAG) capsulotomy.

DISCUSSION

In patients with coexisting cataract and glaucoma previous studies have shown the efficacy of combining trabeculectomy with cataract extraction.[9,10] A visual acuity of 6/12 or better has been reported in up to 90% of patients, and glaucoma control achieved in 85–100% of patients.

In extracapsular cataract extraction (ECCE) combined with trabeculectomy a relatively large conjunctival incision is needed and the scleral wound has to be enlarged for nucleus delivery. The potential disadvantages of this procedure are increased manipulation of conjunctival and scleral flaps with possible increase in post-operative inflammation and subsequent fibrosis of the filtering bleb area and filtering bleb failure.[11,12]

An increasing number of ophthalmologists prefer phacoemulsification with insertion of foldable posterior chamber IOLs, due to reduced surgically induced post-operative astigmatism, promoting a more rapid visual recovery.[13,14] These advantages seem to be preserved when trabeculectomy is combined with small-incision cataract surgery.[7] Previous studies have shown no statistically significant difference in induced astigmatism between small-incision cataract surgery, and combined small-incision cataract surgery and trabeculectomy.[15] A comparison between trabeculectomy combined with phacoemulsification and trabeculectomy combined with ECCE showed no significant difference between the two groups in terms of early or chronic post-operative IOP control.[16] A similar study comparing ECCE and phacoemulsification combined with trabeculectomy reported that the phacoemulsification group had earlier visual rehabilitation, less post-operative astigmatism and better long-term IOP control than the ECCE group.[17] No significant difference in post-operative IOP has been observed between fornix- and limbal-based flaps in combined phacoemulsification and trabeculectomy.[18]

Combined procedures are known to benefit patients with glaucoma and cataract by protecting against severe early IOP increases.[19] Published studies have reported pressures rises in up to 36% of patients with combined procedures[11] compared with the reported incidence of up to 72% in patients with glaucoma undergoing cataract surgery alone.[20] In the present study 6% of the eyes had early post-operative IOPs greater than 24 mmHg.

Authors of previous studies have concluded that by using phacoemulsification and not widening the trabeculectomy opening to implant the posterior chamber lens, post-operative inflammation and subsequent fibrosis of the filtering blebs are reduced.[7,21] Absence of filtering blebs was noted in only 8% of eyes undergoing foldable IOL implantation.[7] Seventy-one per cent of eyes undergoing filtration procedures following phacoemulsification via traditional scleral trabeculectomy flaps required no glaucoma medications post-operatively.[22]

In the current study phacoemulsification was followed by enlargement of the initial scleral opening prior to implantation of a non-foldable IOL. No scleral trabeculectomy flaps were constructed. One hundred eyes with a mean follow-up of 11.1 months showed an obvious improvement in visual acuity post-operatively compared with the pre-operative vision. Seventy-six per cent of eyes attained a visual acuity of 6/12 or better. These findings compare favourably with previous reported studies.[2,11]

The results of IOP control were also excellent. All 88 patients undergoing phacoemulsification and trabeculectomy without antimetabolite supplementation achieved functional long-term results comparable to those of previously reported series.[7] IOP control was achieved in 96% of the eyes, 86% of the eyes were on no medications post-operatively and 93% of the eyes required fewer medications. All eyes with pre-operatively controlled glaucoma achieved IOP control without medication. In the present study a filtering bleb was absent in only 11% of the eyes, which compares favourably with previously reported studies in which foldable IOLs were inserted.[7]

Table II lists all early and late post-operative complications. Post-operative hyphaema is a common complication in combined surgery. The incidence of hyphaema has varied in the published literature.[22] In small-incision groups with foldable implants approximately 14.4% of eyes had hyphaemas during the early post-operative course. In the present series the incidence of hyphaema was 5%. The rate of posterior capsular opacification following small-incision cataract extraction combined with trabeculectomy and insertion of a foldable IOL has been reported in up to 59% of eyes.[7] In our series, capsule thickening needing Nd:YAG capsulotomy was 8%. The prevalence of a shallow or flat anterior chamber occurring after combined surgery has been reported to be between 5% and 26%.[2,11,19] We found the prevalence to be 8%. The incidence of choroidal detachments following glaucoma surgery can vary between 2.9% and 11.6%.[8] Choroidal detachments occurred in 3% of the eyes in the present study. Fibrinous exudation is a common complication in the early post-operative period in combined surgery. Fibrinoid reactions following combined small-incision cataract and glaucoma surgery with implantation of foldable IOLs have been reported in up to 33% of eyes.[23] In the current series, the incidence of fibrinous exudation was 4%.

In summary, the technique of small-incision cataract surgery with non-foldable IOL implantation following enlargement of the initial 2.3 mm opening combined with trabeculectomy described in this study provides excellent results regarding visual recovery, glaucoma control and detectable filtering blebs in patients with concurrent cataract and glaucoma. In the present series, the incidence of complications such as hyphaema, fibrinous exudation and choroidal detachments was favourable compared with previously reported studies.

Key words: Cataract, Glaucoma, Non-foldable intraocular lens, Phacoemulsification, Trabeculectomy.

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