

Combined Small Incision Cataract Surgery Vs. Trabeculectomy: A Retrospective Comparative Study to Assess the Outcome on IOP

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Abstract

Aim: To evaluate the combined small incision cataract surgery and trabeculectomy on intra ocular pressure outcome. **Methods:** A retrospective study was conducted in the department of ophthalmology, Jan Nayak Karpoori Thakur Medical College & Hospital, Madhepura (JNKTMCH), Bihar, India for 1 year. 100 patients who underwent combined manual small incision cataract surgery and trabeculectomy were included in this study. Patients with a diagnosis of combined vision impairing cataract and preoperative glaucoma (including primary open-angle glaucoma (POAG), pseudoexfoliative glaucoma (PXFG), chronic angle closure glaucoma, phacomorphic glaucoma, steroid induced glaucoma or ocular hypertension), and who had postoperative follow-up visits for a year and beyond were included in the study. **Results:** 100 patients were included in the study. Females were larger in number, 60 (60%), than males, 40 (40%). Their age ranged from 42-78 years while the mean age was 65.25 ± 10.98 years. The preoperative ocular characteristics of the operated 100 eyes are depicted in Table 2. The Snellen visual acuity was less than 6/18 in all eyes, and 75 (75%) eyes had vision 6/60 and below. Pseudoexfoliative glaucoma and Primary open-angle glaucoma were the common diagnosis made in 45 (45%) and 25 (25%) eyes, respectively. Cataract that was dense enough not to allow assessment of the optic nerve head was found in 53 eyes (53%). Postoperatively, the preoperative mean intraocular pressure, 28.14 mmHg, decreased statistically significant ($P < 0.0001$). The overall success rate of IOP control at the completion of 12 months follow-up was 90%, Complete 70% and qualified 16%. In the first three months of postoperative period, 88(88%) of the operated eyes were without hypotensive medication. And at one-year follow-up, 70 (70%) of the eyes were free of medication. The mean number of hypotensive medications lowered from 2.75 ± 0.53 preoperative to 1.42 ± 0.72 at 12 months follow up. At the last visit, filtering bleb was present in 75% and flat bleb was recorded in 25% eyes. **Conclusion:** Combined manual small incision cataract surgery and trabeculectomy is effective in terms of IOP control and vision restoration in treating patients with coexisting cataract and glaucoma.

Keywords: glaucoma, cataract, IOP

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Introduction

Glaucoma and cataract are age related multifactorial conditions and leading causes of visual impairment and blindness.[1] Globally, India is the second largest home of glaucoma cases. The prevalence of glaucoma cases in India is reported to be 11.9 million.[2] Primary open angle glaucoma (POAG) and primary closed angle glaucoma (PACG) are the common subtypes of glaucoma exists in India.[3] Small incision cataract surgery is the most acceptable surgical procedure in the management of combined cataract and uncontrolled glaucoma. [4] Trabeculectomy is the gold standard procedure in lowering IOP in all types of glaucoma. The basic concepts in minimizing the intraocular pressure are increase outflow by dilating available anatomical route or making an artificial passage and decrease secretion by medical or surgical means. The duo of cataract and glaucoma procedure are effecting in minimizing long term IOP than cataract extraction alone.[5] Congdon NG et al. noticed 45.3% drop in IOP by trabeculectomy alone than trabeculectomy with 5-fluorouracil combined with cataract surgery.[6] The final success rate of trabeculectomy in terms of IOP reduction is diverse between 39% and 96% depending on the duration of follow up.[7,8] There is a literature lack on the long term control of IOP in cases undergoing small incision cataract surgery with trabeculectomy. The present study was designed to evaluate the long term control of intraocular pressure and morphology of bleb in cases undergoing small incision cataract surgery with trabeculectomy.

Materials and Methods

A retrospective study was conducted in the department of ophthalmology, Jan Nayak Karpoori Thakur Medical College & Hospital, Madhepura (JNKTMCH), Bihar, India for 1 year, after taking the approval of the protocol review committee and institutional ethics committee.

100 patients who underwent combined manual small incision cataract surgery and trabeculectomy were included in this study. Patients with a diagnosis of combined vision impairing cataract and preoperative glaucoma (including primary open-angle glaucoma (POAG), pseudoexfoliative glaucoma (PXFG), chronic angle closure glaucoma, phacomorphic glaucoma, steroid induced glaucoma or ocular hypertension), and who had postoperative follow-up visits for a year and beyond were included in the study. Patients with previous failed filtration surgery, uveitic glaucoma and neovascular glaucoma were excluded.

Glaucoma was diagnosed based on gonioscopy and the presence of characteristic optic disc changes (thinning, excavation or focal notch of the neurosensory rim, or asymmetrical cupping between the eyes of > 0.2) and persistence high intraocular pressure (IOP) of 21 mmHg and above measured on more than one visit. In eye with dense cataract that did not allow examination of the funds, the diagnosis was based on previous record and presence of risk factors including persistently elevated IOP, glaucoma in the other eye, and presence of pseudo-exfoliative material either in the operated or the second eye. Ocular hypertension was diagnosed based on the presence non-excavated optic nerve head, while IOP was persistently high and absence of other risk factors for glaucoma. Postoperative posterior segment examination was used to identify the status of the optic nerve head in eyes that had dense cataract. The surgical steps were similar in all patients: it was performed under retro bulbar anesthesia and the conventional steps of MSICS were followed. Mitomycin C (MMC) 0.2mg/ml was the anti fibrotic agent used and applied under the conjunctiva or Tenon's capsule for 2-3 minutes on the surgical area before half-thickness scleral tunnel construction. Can-opener or capsulorrhexis

technique through side port was the type of anterior capsulotomy done and PMMA IOL was used in all eyes. After completion of the cataract extraction and IOL implantation, posterior sclerostomy was performed at the middle of the floor of scleral tunnel by punching towards the limbal cornea-scleral junction using a Kelly's Descemet punch. The size of the sclerotomy was around 1.5 mm horizontally and 3 mm vertically, while the whole tunnel length vertically at the center was around 4 mm. Peripheral Iridectomy was not routinely done. Two 9-0 or 10-0 nylon sutures, one noted as permanent and the other as releasable were applied to approximate the scleral tunnel close to the sclerostomy site. The conjunctival peritomy was repositioned back and sutured using the same suture material, two simple wing and one mattress at the middle of the limbal peritomy. Deeping of the anterior chamber and bleb formation with solution through side port was done routinely before completion of the procedure. Steroid and antibiotic were injected sub-conjunctively and applied topically before patching the eye overnight. Postoperative eye drops medications included antibiotic for 1-2 weeks and steroids 10-12 weeks. The routine pattern of follow-up for patients with smooth post-operative course was at one day, one week, one month, three months and then every three to six months. During the postoperative visits, releasable suture removal was done under the slit-lamp microscope starting after the first

week follow-up depending on IOP level and bleb formation. Patients' age, sex, number of hypotensive medications that had been used, Snellen visual acuity (best corrected distance vision, i.e., taken either with eye glasses or pinhole), intraocular pressure, (measured with either Goldmann or I-care tonometer at the time of surgery decision) and the type of glaucoma diagnosis were included. Postoperative data: Visual acuity, IOP, prescribed number of hypotensive medications and complications were documented at first week, and at 1, 3, 6 and 12 months.

Data Analysis: The data was analyzed using Statistical Package for Social Sciences (SPSS) version 20. Data of intraocular pressure and number of hypotensive medications used are presented in mean with standard deviation. Paired Student's t-test was used to compare mean preoperative and postoperative intraocular pressure change and independent Student test was used to compare subgroups. Chi-squared test was used to test associations between categorical variables. Statistical significance P- values of <0.05 were considered significant.

Results

100 patients were included in the study. Females were larger in number, 60 (60%), than males, 40 (40%). Their age ranged from 42-78 years while the mean age was 65.25 ± 10.98 years. Majority of the patients, 71 (71%), were age above 60 years (Table 1).

Table 1: Age and sex distribution of patients underwent Manual Small Incision Cataract Surgery Combined with Trabeculectomy.

Age	Sex		Total
	Female	Male	
40 -50	10	1	11
50 - 60	15	3	18
60 - 70	22	20	42
Above 70	13	16	29
Total	60	40	100

The preoperative ocular characteristics of the operated 100 eyes are depicted in Table 2. The Snellen visual acuity was less than 6/18 in all eyes, and 75 (75%) eyes had vision 6/60 and below. Pseudoexfoliative glaucoma and Primary open-angle glaucoma were the common diagnosis made in 45 (45%) and 25 (25%) eyes, respectively. Cataract that was dense enough not to allow assessment of the optic nerve head was found in 53 eyes (53%).

Advanced stage glaucoma diagnosis was made based on glaucomatous optic neuropathy (vertical cup-disc ratio 0.9 and above) in 30 (30%) and 10 (10%) eyes preoperative and postoperative, respectively. The median duration of glaucoma diagnosis was 14 months ranging 1 to 36 months. The mean number of hypotensive medications used was 2.75 ± 0.53 , while 50 (50%) had two drops and 35 patients were taking additional oral acetazolamide tablets.

Table 2: Preoperative ocular characteristics of eyes underwent Manual Small Incision Cataract Surgery Combined with Trabeculectomy

Preoperative ocular characteristics of patients	No of eyes	%
Laterality		
Right eye	60	60
Left eye	40	40
Visual acuity		
<6/18 – 6/60	25	25
<6/60	75	75
Diagnosis		
Pseudoexfoliative glaucoma	45	45
Primary open angle glaucoma	25	25
Ocular hypertension	15	15
Angle closure glaucoma	9	9
Phacomorphic glaucoma	3	3
Steroid induced glaucoma	3	3
Glaucomatous optic neuropathy		
Non glaucomatous (CDR: 0, 0.1, 0.2 and 0.3)	10	10
Early (CDR: 0.4 and 0.65)	3	3
Moderate (CDR: 0.7, 0.8 and 0.85)	4	4
Severe (CDR: > 0.9)	30	30
Opaque media	53	53

Age related macular degeneration, high myopia and diabetic retinopathy were the co-existing ocular pathology in 16 (16%), 12 (12%) and 4 (4%) eyes respectively. After treatment, the preoperative visual

acuity that was less than 6/18 in all the eyes improved to 6/18 and above in 55 (55%), 80 (80%), 76 (76%) and 72 (72%) eyes at first week and 3, 6 and 12 months, respectively (Table 3). Advanced

stage glaucoma, age related macular degeneration, posterior capsular opacity, decentered intraocular lens, and corneal

opacity were the causes documented for eyes with low visual acuity, less than 6/18.

Table 3: Preoperative and post-operative visual acuity of eyes underwent Manual Small Incision Cataract Surgery Combined with Trabeculectomy.

Time	Number of eyes (%)		
	>6/18	<6/18 – 6/60	<6/60
Preoperative	-	25 (25)	75 (75)
In the first week	55 (55)	20 (20)	25 (25%)
3 months	80 (80)	6 (6)	14 (14)
6 months	76 (76)	12 (12)	12 (12)
1 year	72 (72)	10(10)	18 (18)

Postoperatively, the preoperative mean intraocular pressure, 28.14 mmHg, decreased statistically significant ($P < 0.0001$) (Table 4).

Table 4: Intra-ocular pressure of preoperative and during postoperative follow-up visits

Visit	Mean IOP	SD	P-value
Preoperative	28.14	1.18	-
1 week	15.10	0.45	< 0.001
3 months	13.09	1.17	< 0.001
6 months	14.01	1.26	< 0.001
12 months	15.02	1.07	< 0.001

Comparing the different types of glaucoma and ocular hypertension, there was no statistically significant difference in mean baseline and postoperative IOP reduction. POAG, PXFG, and angle closure

glaucoma had mean IOP less than 15 mm Hg throughout the year follow-up, and at 12 months, all the types of glaucoma and OHT had mean IOP below 15 mm Hg as well (Table 5)

Table 5: Comparison of preoperative and postoperative mean intraocular pressure among the different types of glaucoma

Time	Intraocular pressure (SD) in mm Hg among types of glaucoma						P-value
	POAG	PXFG	OHT	CACG	Phacomorphic Glaucoma	Steroid induced G	
Preoperative	26.55 (5.20)	26.14 (8.11)	24.84 (3.15)	26.00 (9.63)	44.20 (21.02)	24.10 (4.31)	0.11
Postoperative							
1 week	12.27 (6.23)	12.63 (7.22)	14.04 (5.53)	7.65 (6.45)	25.25 (3.14)	15.10 (4.04)	0.087
3 months	15.48 (6.14)	14.74 (7.52)	15.67 (4.25)	11.45 (8.83)	10.40 (2.22)	23.40 (12.12)	0.58

6 months	13.18 (5.03)	13.87 (6.12)	19.43 (7.83)	13.03 (8.10)	11.00 (4.24)	15.40 (3.13)	0.33
12 months	12.73 (6.16)	12.60 (6.25)	13.51 (7.33)	12.60 (6.56)	11.10 (2.42)	11.00 (1.11)	0.78

POAG: primary open angle glaucoma, PXFG: pseudoexfoliation glaucoma, OHT: ocular hypertension, CACG: chronic angle closure glaucoma, IOP: intraocular pressure

The overall success rate of IOP control at the completion of 12 months follow-up was 90%, Complete 70% and qualified 16%. The pressure remained above 21 mm Hg in six eyes while they were on hypotensive medications. The analysis of success rate showed no statistically

significant difference either in complete or qualified success rate, or in failure among the different types of glaucoma.

In the first three months of postoperative period, 88(88%) of the operated eyes were without hypotensive medication. And at one-year follow-up, 70 (70%) of the eyes were free of medication. The mean number of hypotensive medication lowered from 2.75 ± 0.53 preoperative to 1.42 ± 0.72 at 12 months follow up (Table 6).

Table 6: Preoperative and postoperative number of anti-glaucoma medications used to control intraocular pressure

Visit	Mean number of medications	Standard deviation	P- value
Preoperative	2.75	0.53	-
3 months	1.10	0.07	<0.001
6 months	1.19	0.65	<0.001
12 months	1.42	0.72	<0.001

At the last visit, filtering bleb was present in 75% and flat bleb was recorded in 25% eyes.

Discussion

The study has assessed the outcome of combined cataract extraction with glaucoma surgery in terms of vision restoration, intraocular pressure control, need of hypotensive drug to control the IOP and complications. Cataract and glaucoma are the two common eye diseases that occur among the elderly population. This was the fact in this study that has identified mean age 65.25 ± 10.98 years. Majority of the patients, 71 (71%), were age above 60 years. Other studies have also reported similar mean age (61.3, 64.13, and 66.20, years) among patients underwent combined procedure either Phaco Trab or MSICS-Trab.[9-12]

Pseudoexfoliative glaucoma was the commonest type of glaucoma diagnosis in

this study, 45 eyes (45%). And this can be explained by the fact that pseudoexfoliation and pseudoexfoliative glaucoma are common conditions among Ethiopians.[13-15] The high and fluctuating nature of IOP in pseudoexfoliative glaucoma requires keeping the IOP at low and stable level, which achievable with filtering surgery as was indicated in this study.

The visual acuity of our patients improved to $\geq 6/18$ in 55 eyes (55%) and 35 eyes (72%) in the first one week and at 12-month follow-up. The number of eyes with visual acuity $\geq 6/18$ during the first one-week postoperative follow-up was less as compared the subsequent visits. This can be explained by the presence of wound inflammatory reaction of the anterior

segment and wound healing process. The visual acuity of $\geq 6/18$ that was achieved at the last follow-up is lower when compared to $\geq 6/12$ in 43 eyes (78.2%) at 3 years in India.[9] On the other hand, visual acuity $\geq 6/18$ that was achieved in 80 eyes (80%) at 3 months, is better as compared to other study report at 8 weeks that achieved the same level of vision improvement in 23 eye (65.7%).[16]

In this study, the mean intraocular pressure was significantly reduced from the baseline mean level (26.55 ± 5.20) and remained below 15 mmHg throughout the year ($P < 0.001$), with mean reduction 12.73 mmHg at last follow-up. This level of IOP is comparable to 13.9 ± 3.81 mmHg reported at 3 years follow-up by Mittal S et al[9] and to an eight weeks mean IOP reduction of 12.52 ± 35 mmHg reported by Khurana AK et al¹¹ And it is better than 17.1 ± 10 mm Hg reported at 6 months follow-up by Thomas R et al.[10] Singh P et al.[12] reported mean IOP reduction from baseline 23.93 ± 0.75 mm Hg to 11.2 ± 1.5 mm Hg at 6 weeks post-operative follow-up in 45 patients, which is lower as compared to the 3 months mean IOP level of this study, 12.29 ± 1.07 mmHg, but the time different should be taken in to consideration.

In the first postoperative week, the IOP remained low in all types of glaucoma and ocular hypertension, except in phacomorphic glaucoma, which can be explained by the presence of anterior chamber reaction before, during and after surgery, which is the nature of the disease.

Among the pseudoexfoliative glaucoma cases, the preoperative 28.14 mm Hg mean IOP remained less than 15 mm Hg during the one-year follow-up period, which is advantageous to keep the IOP low and stable to halt the damaging nature of fluctuating IOP in this form of glaucoma. Additionally, cataract extraction lowers IOP in all types of glaucoma due to widening of the anterior chamber angle and the possibility of remodeling of the

trabecular mesh- work.^{16,17}

The 5 patients with phacomorphic glaucoma underwent the surgery because of delayed presentation, more than a month, and consideration of the possibility of persistence angle closure; otherwise, they could have been managed by cataract extraction alone.

The 90 successes of IOP control (IOP < 21 mmHg) with and without medication, at the last follow up, is comparable with that of retrospective comparative study of MSICS-Trab (a similar procedure with this study) and Phaco-Trab done in India, that achieved 89.0% and 92.3% success at 3 years follow-up, respectively. On the other hand, it is better than other study report from the same country with mean 6 months follow up that achieved IOP control in 73% MSICS-Trab group and in 75.6% Phaco-Trab group.[9,10]

88 (88%) and 70 (70%) eyes required no hypotensive drugs after the surgery during the first three months and the last follow up period, which is beneficial to the patients in terms of cost, being free of drug side effects and the physiological impact of having and applying medications. It is also beneficial and encouraging to the treating physician to have his/ her patient being managed with less frequent follow-up visit.

The procedure enabled to reduce the number of hypotensive drugs that had been used prior to the surgery. The mean number of hypotensive medications lowered from 2.75 ± 0.53 preoperative to 1.42 ± 0.72 at 12 months follow up. The other studies, mentioned above, have also reported postoperative reduction of hypotensive drugs need.[9]

The type and frequency of occurrence of both intra-operative and postoperative complications varies among studies reports, including this study.[9,10,12] Pupillary fibrinous inflammatory membrane, the type of early postoperative complication, documented in three eyes,

could be related to the surgical manipulation to the anterior chamber structures during the surgical procedure. Besides, two of the three eyes were with pseudexfoliation, which by itself is associated with more wound reaction than the other types of glaucoma. The possibility of non-detailed documentation of clinical information during the preoperative, intra-operative and postoperative periods is believed to be the limitation of this retrospective study.

Conclusion

Combined manual small incision cataract surgery and trabeculectomy is effective in terms of IOP control and vision restoration in treating patients with coexisting cataract and glaucoma.

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