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Combined small incision cataract surgery and trabeculectomy on intra ocular pressure outcome

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Abstract
Trabeculectomy is a gold standard filtration procedure in the management of glaucoma. However, small incision cataract surgery with trabeculectomy is the combined surgical procedure for the management of coexisting glaucoma and cataract. The final success rate related to minimizing intraocular pressure (IOP) depends on the follow-up duration and assessment criteria. This study was aimed to evaluate the long term control of intraocular pressure and morphology of bleb in cases undergoing small incision cataract surgery with trabeculectomy. One hundred cases diagnosed with moderate or severe glaucomatous damage with cataract above 32 years were recruited. Postoperative follow up was done from day 1 to 12 months, to evaluate the intraocular pressure (IOP), bleb morphology and postoperative complications. In PAOG, 61.3% cases had good control and 60% cases had poor control of postoperative IOP. In PACG, 32% cases had good control and 28% cases had poor postoperative IOP control. In the overall success, the qualified success rate was 63% and the complete success rate was 97%. Cases with early postoperative IOP of >10mmHg on 5th day or >13mmHg on 10th day is associated with poor control of intraocular IOP at the end of 12th month. Small incision cataract surgery with trabeculectomy is an effective procedure in reducing the intraocular pressure.

Keywords: Small incision cataract surgery, trabeculectomy, glaucoma, intraocular pressure

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 comments 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
The present prospective interventional study was conducted in the Department of Ophthalmology at the Kamineni Academy of Medical Sciences and Research Centre, Hyderabad from September 2019 to September 2020. The written informed consent was obtained from all the study participants and the study protocol was approved by institutional ethics committee. A total of 100 cases attending ophthalmology OPD diagnosed with moderate or severe glaucomatous damage with cataract were recruited. Cases above 32 years of age diagnosed with combine POAG, PAGG and secondary glaucoma and willing to participate in the study were included. Cases with the past history of cataract surgery and trabeculectomy, Cases with neovascular glaucoma and not willing to participate were excluded.

The surgical procedure was performed under peribulbar anaesthesia. Post-operative eye drops, medication included antibiotics (Moxifloxin) for 1-2 weeks and steroids (Prednisolone) for 10-12 weeks. Postoperative follow up was done to all the participants at day 1, day 5, day 10, 1 month, 3 months, 6 months and 12 months. Parameters like intra ocular pressure (IOP), visual acuity, bleb morphology, peripheral iridectomy patency, depth of anterior chamber and details of postoperative complication were recorded on every visit. The success of IOP was graded like qualified success and complete success. Qualified success has IOP in the range of 5-20 mmHg with hypertensive medication. Complete success rate has IOP in the range of 5-20 mmHg without hypotensive medication. The collected data was analysed by using SPSS statistical software. Descriptive statistics were used to represent demographic data. Student t test were analysed to compare the pre and postoperative IOP changes.

Results

Table 1: Demographic data of the study participants

Parameter	Total cases	
	Number	Percentage
Age (In years)		
32-40	18	18%
41-50	36	36%
51-60	22	22%
61-70	13	13%
>70	11	11%
Laterality		
Unilateral-Right side	41	41%
Unilateral Left side	43	43%
Bilateral	06	6%
Types of glaucoma		
PAGG	22	22%
POAG	62	62%
SAGG	06	06%
SOAG	10	10%
Severity of glaucoma		
Moderate	19	19%
Severe	81	81%

The 46% cases with disease duration <1 year had irregular medication and 6% had regular medication. In 22% cases with disease duration between 1-5 years had irregular medication and 18% had regular medication. The cases with disease duration above 6 years were under irregular medication.

Table 2: Comparison preoperative and post-operative ranges of IOP

Follow up	Intraocular pressure	*p*-value
	Mean ± SD	
Before surgery	28.40 ± 1.24	-
At 1 week	16.23 ± 1.30	0.004
At 3 months	14.98 ± 1.42	0.004
At 6 months	13.54 ± 1.06	0.002
At 12 months	14.16 ± 0.99	0.001

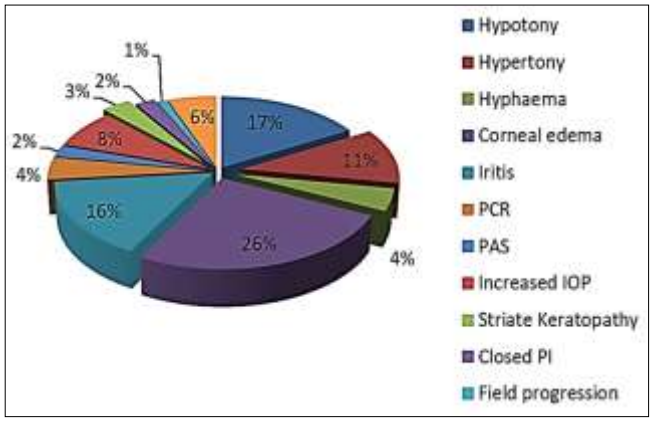

Fig 1: Post-operative complications

Table 3: Details of bleb morphology in postoperative follow up (n = 100)

Follow up	Type 1	Type 2	Type 3	Type 4
1 month	-	85 (85%)	15 (15%)	-
3 months	-	82 (82%)	18 (18%)	-
6 months	-	77 (77%)	23 (23%)	-
1 year	-	71 (71%)	29 (29%)	-

Table 4: Assessment of risk factors for flat bleb

Parameters	Flat bleb		*p*-value
	Diffuse bleb (n = 71)	Flat belb (n = 29)	
Age (In years)			
<50	08 (11.2%)	05 (17.2%)	0.571
>50	63 (88.7%)	24 (82.7%)	
PAOG			
Present	45 (63.3%)	22 (75.8%)	0.589
Absent	26 (36.6%)	07 (24.1%)	
PACG			
Present	21 (29.5%)	8 (27.5%)	0.635
Absent	50 (70.4%)	21 (72.4%)	
Usage of anticoagulant drugs			
Regular use	28 (39.4%)	20 (68.9%)	0.252
Not regular/not used	43 (60.5%)	09 (31%)	
Severity of glaucomatous damage			
Moderate	14 (19.7%)	05 (17.2%)	0.328
Severe	57 (80.2%)	24 (82.7%)	
Status of vascularisation			
Present	9 (12.6%)	18 (62%)	0.004
Not present	62 (87.3%)	09 (31%)	

Table 5: Assessment of risk factors for poor control of postoperative intraocular pressure

Parameters	Postoperative IOP		*p*-value
	Good control (n = 75)	Poor control (n = 25)	
Age (In years)			
<50	10 (13.3%)	05 (20%)	0.673
>50	65 (86.6%)	20 (80%)	
PAOG			
Present	46 (61.3%)	15 (60%)	0.238
Absent	29 (38.6%)	10 (40%)	
PACG			
Present	24 (32%)	07 (28%)	0.297
Absent	51 (68%)	18 (72%)	
Status of preoperative IOP			
>30 mmHg	25 (33.3%)	07 (28%)	0.515
<30 mmHg	50 (66.6%)	18 (72%)	
Postoperative IOP on 5th day			
>10 mmHg	15 (20%)	11 (44%)	0.001
<10 mmHg	60 (80%)	14 (56%)	
Postoperative IOP on 10th day			
>13 mmHg	18 (24%)	20 (80%)	0.004
<13 mmHg	57 (76%)	05 (20%)	
Beta blockers			
Used	19 (25.3%)	08 (32%)	0.584
Not used	56 (74.6%)	17 (68%)	
Severity of glaucomatous damage			
Moderate	18 (24%)	06 (24%)	0.412
Severe	57 (76%)	19 (76%)	
Status of flat bleb			
Flat bleb	14 (18.6%)	10 (40%)	0.324
Diffuse bleb	61 (81.3%)	15 (60%)	
Status of vascularisation at 6th month			
Present	10 (13.3%)	10 (40%)	0.001
Not present	65 (86.6%)	15 (60%)	
Status of vascularisation at 12th month			
Present	06 (8%)	04 (16%)	0.003
Not present	69 (92%)	21 (84%)	

Fig 2: Details of success rate in the present study

Discussion

Trabeculectomy is commonly used to minimize intraocular pressure (IOP) in glaucoma [9]. It is a gold standard procedure for glaucoma. The final success of the procedure in terms of IOP reduction varies between 39-96% depending on the duration of follow up and the criteria used in defining success [10, 11]. The present study was undertaken to evaluate the long-term control of intraocular pressure in cases undergoing small incision cataract surgery with trabeculectomy. The present study consists of 100 cases diagnosed with moderate or severe glaucomatous damage with cataract above 32 years were recruited. Majority cases were in between age group 41-50 years (36%) followed by 51-60 years (22%). A study by Abeba T. Giorgis and Addisu Worku recruited the case ranged from 48-82 years with a mean age 66.10 years. However, majority cases were above 60 years of age [12]. Among the study cases, 84% cases were operated unilaterally (41% right side & 43% left side) and 16% cases were operated bilaterally. In a study by Abeba T. Giorgis and Addisu Worku, 59.2% cases had surgery to right eye and 40.8% had surgery to left eye [12]. Primary open angle glaucoma (POAG) was the commonest type in 62% cases, followed by PAGG (22%), SOAG (10%) and SAGG (6%). Among the study cases, 81% had severe glaucoma and 19% cases had moderate glaucoma (Table 1). A study by Abeba T. Giorgis and Addisu Worku reported pseudoexfoliative glaucoma in 44.95% cases and primary open angle glaucoma in 24.5% cases [12].

In this study, the preoperative IOP was 28.40 mmHg and was statistically decreased at 1 week (16.23 mmHg), at 3 months (14.98 mmHg), at 6 months (13.54 mmHg) and at 12 months (14.16 mmHg) (Table 2). In a study by Abeba T. Giorgis and Addisu Worku noted that the value of preoperative IOP (27.04 mmHg) was gradually decreased post-operatively as 13.00 mmHg, 13.10 mmHg, 14.38 mmHg and 13.41 mmHg at 1st week, 3rd week, 6th month and 12th month respectively [12]. A study by Singh P *et al*. reported mean IOP reduction from baseline 23.93 mmHg to 11.2 mmHg at 6 weeks of postoperative follow up, which is lower when compare the present study [13].

Among the study cases, 26% had corneal oedema followed by hypotony (15%), iritis (14%), hypertony (10%),

increased IOP (7%), shallow anterior chamber (5%), hyphaema (4%), PCR (4%), striate keratopathy (3%), closed PI (2%), PAS (2%) and field progression (1%) (Fig 1). Bleb morphology during post-operative follow up at 1, 3, 6, 12 months in study cases showed that 85%, 82%, 77% and 71% cases had type 2 diffuse bleb and 15%, 18%, 23% and 29% had type 3 flat bleb. In a study by Verma A and Yadav P on first postoperative day noted hyphaema in 4.5%, hypotony in 72.7%, hypertony in 4.5% and shallow anterior chamber in 18.1% cases [14]. A study by Usha BR *et al.* noted the similar postoperative complication like hyphaema in 16% cases [15].

In the present study, assessment of risk factors for flat bleb showed, among 71 eyes with diffuse bleb, 63.3% had PAOG and in 29 with flat bleb 22 had PAOG. The difference was statistically not significant (p=0.571). 29.5% cases had PACG in diffuse bleb and 27.5% cases had PACG in flat bleb. The difference was statistically not significant (p=0.635). In cases with flat bleb, 82.7% cases and in diffuse bleb 80.2% cases had severe glaucomatous damage. The difference was statistically not significant (p=0.328). In cases with flat bleb, 31% cases and in diffuse bleb 39.4% cases were on regular usage of anticoagulant drugs. The difference was statistically not significant (p=0.252). The vascularisation status was a risk factor for both flat bleb and poor control of IOP in the postoperative period which was supported by the findings of Sandra Furrer *et al*. mentioning that excessive vascularisation showed a fair agreement with higher postoperative IOP [16].

In PAOG, 61.3% cases had good control and 60% cases had poor control of post-operative IOP. In PACG, 32% cases had good control and 28% cases had poor post-operative IOP control. The difference was statistically not significant (p>0.005). Cases with early postoperative IOP of >10mmHg on 5th day or >13mmHg on 10th day is associated with poor control of intraocular IOP at the end of 12th month. A study by Ndife TI *et al*. stating that the mean IOP before trabeculectomy and trab-SICS was 27.6 mmHg and 22.4 mmHg respectively. At the final postoperative visit, the IOP had significantly reduced to 14.5 mmHg after trabeculectomy [9]. In a study by Abeba T. Giorgis and Addisu Worku found no significant difference in mean baseline IOP and postoperative IOP reduction [12]. A study by Rong SS *et al*. stated that cases with high IOP earlier indicated outcome with high IOP, However cases with early low postoperative IOP had higher success rate [17]. Similarly, Stead and King, Adegbehingbe and Majemgbasan found significant reduction in IOP following trabeculectomy [18, 19]. In the overall success, qualified success rate was 63% and complete success rate was 97%. In PAOG, qualified success rate was 97.5% and complete success rate was 58%. In PACG, qualified success rate was 99.5% and complete success rate was 75%. In a study by Ndife TI *et al*. noted complete success in 33.3% and qualified success in 64.1% in trabeculectomy procedure, whereas in Trab-SICS, complete success was seen in 44.1% and qualified success in 50% [9]. In a study by Abeba T. Giorgis and Addisu Worku noted overall success rate of IOP control after of 12 months follow up was 87.3%, complete success rate was 71.4% and the qualified success rate was 16.3% [12].

Conclusion

In PAOG, 61.3% cases had good control and 60% cases had poor control of post-operative IOP. In PACG, 32% cases had good control and 28% cases had poor post-operative IOP control. In the overall success, qualified success rate was 63% and complete success rate was 97%. Cases with early postoperative IOP of >10mmHg on 5th day or >13mmHg on 10th day is associated with poor control of intraocular IOP at the end of 12th month. Small incision cataract surgery with trabeculectomy is effective procedure in reducing the intraocular pressure.

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