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Evaluation of effectiveness of trabeculectomy in patients suffering with primary adult onset open angle glaucoma

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ABSTRACT

Glaucoma is one of the chief cause for irreversible blindness in the world that results from raise in intraocular ocular pressure. trabeculectomy is one the oldest and good standard surgical method for reducing intraocular tension and thereby aiding the effective management of Primary Adult Open Angle Glaucoma(POAG), evening the current era of advanced techniques like laser trabeculectomy. The current study prospective study was conducted at Government Medial College and General Hospital, Anantapuramu and is aimed at studying the efficacy of Trabeculectomy procedure as a modality of treatment for managing Primary Adult Onset Open Angle Glaucoma. The results obtained from the suggested that still the procedure can be followed as a front-line procedure for managing POAG.

Keywords: Intraocular Pressure, Primary Adult Onset open angle Glaucoma(POAG), Trabeculectomy

Introduction

Glaucoma is the leading cause of irreversible blindness all over the world and constitutes one of the greatest problems in ophthalmology worldwide. Glaucoma has been nicknamed the "Silent thief of sight" because the loss of vision normally occurs gradually over a long period of time, and is often only recognized when the disease is quite advanced. Once lost, the damaged visual field cannot be recovered. The term "glaucoma", has been reserved for people who had established, visually significant, end organ damage i.e., a visually significant optic neuropathy associated with characteristic structural damage to the optic nerve and associated visual dysfunction caused by various pathological processes[1].Glaucoma is a constitute a group of disorders where in the intraocular pressure is too high and that share an acquired optic neuropathy, characterized by cupping of the optic nerve head and thinning of the neuroretinal rim.

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When there is significant loss of the optic nerve tissue, patients develop optic nerve related visual field loss. Intraocular pressure is considered a major risk factor for developing glaucoma, though it is not a necessary part of the disease [2].

Intraocular pressure has always been considered as a main risk factor for the development and progression of glaucoma and hence interventions both medical and surgical are directed towards reduction of intraocular pressure to a level that allows good perfusion of optic nerve head so that its function remains optimal. Trabeculectomy is one of such surgical procedure which helps in decreasing and maintaining the intra ocular pressure and thereby assisting in arresting the progression of the disease. Since the late 1960's trabeculectomy has been the operation of choice for improving aqueous outflow in glaucomatous eyesand trabeculectomy is still regarded as the gold standard to which the newer operations are compared[3,4]

The glaucoma management is directed towards reduction of intraocular pressure to a level that allows it to remain viable via good perfusion of the optic nerve head[5].

The aim of the current study is to evaluate the efficacy of surgical trabeculectomy in reducing IOP in patients suffering from Primary Adult Onset Open Angle Glaucoma in rural population.

Materials and methods

The current prospective study was carried out at Government Medical College and Government General Hospital, Anantapuramu from 1st June2014 to 31st May 2015 and included 40 patients suffering with primary adult onset open angle glaucoma and undergoing trabeculectomy. The following subjects with primary adult onset open angle glaucoma are excluded from the current

Exclusion Criteria

1. Patients diagnosed to have secondary glaucoma, congenital glaucoma, angle closure glaucoma.
2. Patients who had already under went trabeculectomy in the past.
3. Patients who has undergone argon laser trabeculectomy for glaucoma.
4. Primary juvenile glaucoma and suspected subjects having juvenile glaucoma.

Consent was take from all subjects included in the study after properly explaining the procedure of trabeculectomy and its complications. Clearance from institutional ethics committee was obtained prior to staring of the study. Proper preoperative investigations and clinical examination was carried out in all subjects using standard protocols. Gonioscope was done using Goldman three mirror lens. IOP measurement using Goldman's applanation tonometer and confirmed with rebound tonometer. Visual field: central 30^{o} with Auto perimeter, Grading of the visual field Constriction was done according to the Kanski's Classification. Fundus Examination using Direct Ophthalmoscope and +90 D Lens using slit lamp with prior dilatation of the pupils. Fundus photography using Zeiss fundus camera.Surgical trabeculectomy was performed in the operation theatre of the department of Ophthalmology at Government General Hospital, Anantapuramu with prior hospitalization and under local anesthesia to be advocated by the peri-bulbar technique. . All the patients had undergone fornix based trabeculectomy in the superior quadrant by modified Cairn's technique. Patients are delivered with postoperative care with analgesics, antibiotics, topical steroids and antibiotics for four days. All patients were discharged at 4th days with drugs. Follow-up examinations was taken at 2nd, 4th and 6th week postoperatively which included thorough examination under the slit lam bio microscopy, visual acuity using Snellen's chart, IOP recording with Goldman's applanation tonometer, direct and indirect ophthalmoscopy.

The results thus obtained are tabulated in a pretested proforma and analyzed using appropriate statistical methods (Results on continuous measurements are presented on Mean ± SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5% level of significance. The following assumptions on data are made, Assumptions: 1. Dependent variables should be normally distributed, 2. Samples drawn from the population should be random, Cases of the samples should be independent. Analysis of variance (ANOVA) has been used to find the significance of study parameters between three or more groups of patients, Student t test (two tailed, independent) has been used to find the significance of study parameters on continuous scale between two groups Inter group analysis) on metric parameters. And student t test (two tailed, dependent) has been used to find the significance of study parameters on continuous scale within each group.

Results and discussion

Age and Gender Distribution (Table-1): The current study indicated that the sufferers of POAG are in 28 to 82 years are group with a mean of 58.96±13.46 years. Male to female ratio was 22:18; The most frequent age group among both males and females was more than 60 years. Increasing age therefore becomes a significant risk factor. Similar results were noticed in studies conducted by 6,7and 8. No significant gender wise distribution of cases is observed.

Table 1: Age and Sex wise distribution of cases

Age in years	Male		Female		Total	
	No	%	No	%	No	%
<=30	1	4.5	0	0	1	2.5
31-40	3	13.6	0	0	3	7.5
41-50	2	9.1	6	33.3	8	20
51-60	5	22.7	6	33.3	11	27.5
>60	11	50	6	33.3	17	42.5
Total	22	99.9	18	99.9	40	100

POAG and associated systemic diseases: Table 2 shows that 17.5% patients had associated hypertension, 25% patients had diabetes and 7.5% patients had both hypertension and diabetes, 7.5% were associated with bronchial asthma along with POAG. Similar findings are noticed by authors in 9 and 10.

Table 2: POAG and associated systemic conditions

Asso. Systemic Conditions	No. of patients(n=40)	Percentage %
Nil	17	42.50
Yes	23	57.50
Asthma	3	7.50
DM	10	25.00
DM+HTN	3	7.50
HTN	7	17.50

Pre-Operative Best corrected visual acuity (Table -3) : It is observed that 55% of the patients had visual acuity of ≤ 6/60 and 42.5% of patients had visual acuity between 6/36 to 6/18. So, 97.5% of patients had visual acuity of ≤6/18. The current study indicates that most of the patients had poor visual acuity and hence it can be inferred that glaucoma as one of the leading causes of blindness. Similar postulations were observed in studies conducted by 11.

Table 3: Preoperative best corrected Visual Acuity

Pre-op BCVA	No. of patients(n=40)	%
6/6-6/12	**1**	**2.5**
6/18-6/36	**17**	**42.5**
6/60	**10**	**25**
<6/60	**12**	**30**

POAG and Pupillary Reaction (Table -4): It is illustrated from Table-3that, 62.5% of the subjects had sluggishly reacting pupils, 15% subjects had very sluggishly reacting pupils and in 5% of subjects' pupils were not reacting to light at all. Present study indicate that pupillary reaction forms an important factor for diagnosing primary open angle glaucoma. similar findings are put forwarded in studies conducted by 12 and 13.

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Table 4: POAG and Pupillary Reaction

Pupillary Reaction	Number of patients	%
Normal	7	17.5
Non-reacting	2	5
Sluggish	25	62.5
Very sluggish	6	15
Total	40	100

POAG and Cup Disc Ratio (Table -5): The trends observed in the current study point out that 67.5% patients had Cup-Disc ratio between 0.6 to 0.8, while 7.5% patients had Cup-Disc ratio of 0.9. This finding suggest that 75% patients had Cup-Disc ratio above 0.6. in present study out of 67.5% patients with 0.6 to 0.8 cup disc ratio, 40% patients had increased vertical cup disc ratio compared to horizontal. Finally, it can be opined that increased vertical cup disc ratio is one of the significant risk factors for the development of glaucomatous visual field loss. This opinion was reiterated by the studies conducted by 14 and 15. The obvious reason for optic disc cupping is increased Intra Ocular Pressure. It can be postulated that any eye with the combination of IOP consistently above 20 mm Hg and cup disc ratio of 0.5 or more is at higher risk of suffering from glaucoma.

Table 5: POAG and Cup-Disc Ratio

Fundus Cup-Disc Ratio	No. of patients	%
0.5	10	25
0.6	8	20
0.7	12	30
0.8	7	17.5
0.9	3	7.5
Total	**40**	**100**

POAG and Visual Field Defects: Table -6 indicates that 27.5% patients had grade 1 visual field defect (early visual find defect), 30% patients had grade II (arcuate scotoma) visual field defect and 17.5% patients had grade III (severe damage with extensive visual field loss to small residual fields). So, 75% patients suffer from visual field defects ranging from grade I to grade III.

Other Authors in their studies16, and 17 have found similar results. It is observed from this study that patients had intra ocular pressure above 20 mm Hg and 75% patients had visual field defects. It indicates that majority of the patients having undiagnosed primary open angle glaucoma for a quite number of years.

Table 6: Glaucoma and Visual field defects

Fields	No. of patients (n=40)	Percentage %
Normal	7	17.5
Not Recorded	3	7.5
1	11	27.5
2	12	30
3	7	17.5

Outcomes of Trabeculectomy in POAG in terms of IOP: In our study Intra-Ocular Pressure was predominantly in the 20-47 mm Hg range and more in the age group of more than 60 years. Mean range of IOP in all eyes was 31.58±7.22 mm Hg. Post operatively the IOP was predominantly in the range of 11-20 mm Hg range with a mean of 14.98±4.75 mm Hg showing 52.56% reduction; with a p-value <0.001 which is highly significant(Table-7).Similar findings are observed in studies conducted by other authors as depicted in Table No.8

Table 7: Pre-and Post-Operative reduction of Intraocular pressure

	No Anti-glaucoma medications		**Anti-glaucoma medications**	
	Mean IOP (mm Hg) with SD	% reduction from pre-op	Mean IOP (mm Hg) with SD	% reduction from pre-op
Pre-op	34.38±6.14	-	28.47±7.18	-
2nd week follow up	15.52±4.35	54.85%	13.95±3.91	51.00%
4th week follow up	15.19±4.49	55.82%	13.84±4.26	51.39%
6th week follow up	15.62±4.75	54.57%	14.26±4.78	49.91%

Table 8 Comparison of reduction of IOP postoperatively without medication

Authors	Success Rate without medication (IOP ≤21 mm Hg) as criteria
Jerndal and Lundstom (1977)[18]	58%
D'Ermo (1979)-[19]	65%
Watson and Grierson [4]	83%
Tornqvist (1991)[20]	56%
Drolsum (1991)[20]	43%
Mietz (1999)[21]	53%
Popovic and Sjostrand (1999)[22]	64%
Edmunds (2001)[129]	66%
Present Study (2016)	87.5%

Early post-operative complication (Table-9): Elevated IOP at the end of the first postoperative month resulting from insufficient filtration was only complication associated with failure. This highlights the importance of the early postoperative follow-up visits after trabeculectomy and the chance to save some of the filtering blebs from scaring during the first postoperative months. Proper care and recognizing clinical signs possibly associated with poor development of the filtering bleb and adjusting the postoperative anti-inflammatory medication in these eyes might enhance long-term bleb function. The most frequent postoperative complications of trabeculectomy include shallow anterior chamber and choroidal detachment. The incidence of shallow or flat anterior chamber in different reports ranges from 4.8% to as high as 70%. In this study we encountered 17.5% eyes with shallow or flat anterior chamber.

Table 9: Early Postoperative Complications

Early Complications	No. of patients(n=40)	Percentage %
Nil	**22**	**55.00**
Yes	**18**	**45.00**
Ac reaction (ACR)	4	10.00
Burning sensation (BS)	2	5.00
Hyphema (HYP)	1	2.50
Hypotony (HYPO)	2	5.00
Shallow AC(SAC)	7	17.50
Wound Leak WL(WL)	2	5.00

Some of the comparative studies observed by different authors are presented in table no.10 below.

Table 10: Comparative studies as to complications of surgery

Authors	Hyphema	Shallow AS	Flat Anterior chamber
D'Ermo (1979)[19]	9%	-	4%
Mill's(1981)[23]	7%	9%	4%
Tornquist (1991)[20]	17%	-	16%
Popovic (1995)[22]	25%	13%	3%
Present Study (2016)	2.5%	17.5%	2.5%

Visual acuity after Trabeculectomy: It is observed from table-11 that the present study that 19 eyes (47.5%) improved visual acuity and 19 eyes (47.5) had same visual acuity. Though Trabeculectomy is not intended to improve the vision, my study has shown to have improvement in visual acuity in most of these patients. Similar findings were notice in studies conducted by 4.

Table 11: Post-operative improvement of visual acuity

BCVA	≤10 mm Hg		> 30 mm Hg	
	No of Patients	Percentage %	No of Patients	Percentage %
≤6/60	10	43.40%	4	23.50%
6/36 - 6/18	8	34.80%	13	76.50%
6/12 - 6/6	5	21.7%	0	0
Total	**23**	**100**	**17**	**100**

In present study there was good amount of change noted in visual acuity in the group of patients who had pre-intervention IOP more than 30 mm Hg or less than 30 mm Hg.

Outcome of IOP in combined procedure versus trabeculectomy alone: It is depicted in Table-12 and Table-13 that 17 cases (42.5%) of the sample size underwent trabeculectomy alone and 23 cases (57.5%) underwent combined surgery i.eTrabeculectomy with SICS and PCIOL at the same sitting. The mean preoperative IOP in combined group was 30.17±7.18 mm Hg and post-operative IOP at 2nd, 4th, 6th week was 13.59±3.02, 13.65±3.13 mm Hg respectively showing 54.76% reduction. On the other hand the preoperative IOP in Trabeculectomy alone was 33.47±7.03 mm Hg and post-operative IOP at 2nd,4th and 6th week was 16.41±5.0, 16.00±5.41, 16.76±5.87 mm Hg respectively showing 49.93% reduction with a p value < 0.001 at all occasion which is significant. Similar findings were noted in another study conducted by 24.

Table 12: Trabeculectomy alone and Trabeculectomy along with other procedures

Procedure	No. of patients	Percentage %
Trabeculectomy + SICS + PCIOL(A)	22	55
Trabeculectomy + SICS (B)	1	2.5
Trabeculectomy (C)	17	42.5
Total	40	100

	Combined Procedure		Trabeculectomy	
	Mean IOP (mm Hg) with SD	% reduction from pre-op	Mean IOP (mm Hg) with SD	% reduction from pre-op
Pre-op	30.17±7.18	-	33.47±7.03	-
2nd week follow up	13.59±3.02	54.96%	16.41±5.01	50.97%
4th week follow up	13.48±3015	55.32%	16.00±5.41	52.19%
6th week follow up	13.65±3.13	54.76%	16.76±5.97	49.93%

Table 13: Outcome of IOP in combine procedures

	Combined Procedure		Trabeculectomy	
	Mean IOP (mm Hg) with SD	% reduction from pre-op	Mean IOP (mm Hg) with SD	% reduction from pre-op
Pre-op	30.17±7.18	-	33.47±7.03	-
2nd week follow up	13.59±3.02	54.96%	16.41±5.01	50.97%
4th week follow up	13.48±3015	55.32%	16.00±5.41	52.19%
6th week follow up	13.65±3.13	54.76%	16.76±5.97	49.93%

Factors Associated with outcome of IOP: In the present study the preoperative mean IOP in males and females was 31.68±7.04 and 31.44±7.63 mm Hg respectively and post-operative mean IOP at 6th week was 15.45±4.44 and 14.39±5.18 mm Hg with 51.23% and 54.23% reduction of IOP from initial preoperative value respectively. There was female preponderance (p value <0.001).

It is observed in the present study that preoperative mean IOP in cases less than 50 years of age was 30.08±5.59 mm Hg and post-operative mean IOP at 6th week was 13.58±3.52 mm Hg with 54.85% reduction whereas preoperative mean IOP in cases with age more than 50 year was 32.31±7.81 with post-operative mean IOP at 6th week was 15.57±5.13 mm Hg and 51.66% reduction in IOP was observed with significant difference was observed in two groups (p<0.001).

Conclusion

Glaucoma is the leading cause of irreversible blindness all over the world and constitutes one of the greatest problems in ophthalmology worldwide. India is a vast country with over a billion people. The expected burden of glaucoma in India is said to be around 11.2 million.

The best approach to glaucoma therapy in developing countries is yet to be determined. The chronic use of costly topical medications, impose a significant burden on the economic and social life of the patients, most of whom are not well to do. Close to 70% of the country's population reside in villages. There are obvious differences in the availability and access to health care between the urban and rural parts of the country. While the people in the cities have access to the latest technologies, there is no care available in the rural areas.

The review of recent literature highlights the usefulness and desirability of early Trabeculectomy as the first line of therapy.

Since the time of its onset, Trabeculectomy has gained popularity as the surgery of choice for regulating the intraocular pressure in glaucoma which poses major threat as per as the vision of the patient is concerned. As intraocular pressure control is one of the major factors for advancement in glaucomatous changes, it thus provides an ideal platform for halting the progression of the disease. It has been effective in controlling the pressures below the critical levels and prevents further visual deterioration thus providing stable visual acuity.

A very high percentage of patients are already suffering from advanced glaucomatous optic neuropathy with markedly raised IOP at the time of seeking medical attention.

Inadequate follow up in assessing glaucomatous progression and poor patient compliance due to unavoidable difficulties such as transportation and poverty makes a single surgical intervention desirable especially in a rural area, particularly if a large IOP lowering effect is achievable.

The serious complications of Trabeculectomy are not very frequent but complications of clinical significance do occur which may be devastating in the form of Endophthalmitis. Not only is the ability to detect and manage complications of the surgery critical to success but routine post-operative management and follow up are of utmost importance for the long-term control of IOP without any adjuvant medical therapy.

Hence the key to successful management of complications following trabeculectomy is anticipating and preventing complications as and when possible, and early detection with timely appropriate intervention.

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References

1. Fostrel PJ, Burhrmann R, Quigley H. The definition and classification of glaucoma in prevalence surveys. Br. J Ophthalmol 2002; 86(2): 238-42.
2. Shields MB. Textbook of Glaucoma. 4th ed. Baltimore: Williams and Wilkins, 1997-p, 1-
3. Cairns JE. Trabeculectomy. Trans Am AcadOphthalmolOtolaryngol 1971; 75:139-6.
4. Watson PG. surgery of the glaucomas. Br J Ophthalmol 1972; 56:299-303.
5. The Foundation of American Academy of Ophthalmology. Basic and Clinical Science Course- Glaucoma (sec 10), 2001 – 2002, San Francisco (USA).
6. Yuan Bo Liang, David S. Friedman, Qiang Zhou et al. Invest Ophthalmol. Vis Sci. 2011 ;52 (11): 8250-8257.
7. Gordon M. O. the ocular hypertension treatment study. Arch Ophthalmol, 2002; 120:714-720.
8. J Cheng, Jin-Wei; Cheng, Shi-Wei et al. Journal of Glaucoma: April/May 2013 22(4) : 301-306.
9. Kahn H. A. and Milton R. C, Alternative definitions of open-angle glaucoma. Effect on

prevalence and associations in the Framinghan eye study. Arch Ophthalmol, 1980; 98: 2172-2177.
10. Sihota R, Gupta V, Agarwal HC. Long term evaluation of trabeculectomy in primary open angle glaucoma and chronic primary angle closure glaucoma in an Asian population. Clin Experiment Ophthalmol. 2002; 32(1):23-8.
11. Nangia V, Jonas JB, Gupta R, Khare A, Sinha A. Visual impairment and blindness in rural central India: the Central India Eye and Medical Study, ActaOphthalmol. 2013; 91(5): 483-6.
12. Hashimoto – Takahashi E. Pupiliary dynamics in patients with primary open angle glaucoma. Bull Osaka Med Coll, 1990; 36: 71-77.
13. Khadikova E. V., Romanova T.B. and Anakin V.F., Pupilography in early diagnosis of primary open-angle glaucoma. VestnOftalmol, 1997; 113: 12-14.
14. Hart W. M. Multivariate analysis of the risk of glaucomatous visual field loss. Arch Ophthalmol, 1979; 97: 1455-1458.
15. Barbara E.K. Klein, Ronald Klein et al. Does the intraocular pressure effect on optic disc cupping differ by age: Trans Am Ophthalmol Soc. 2006 ; 104:143-148.
16. Mansberger SL., Predictive value of a 1-day, 1-eye trial on the 1-month ocular hypotensive response of Latanoprost 0.005%. Am. Jr. Ophthalmol, 2001; 132 : 869-871.
17. Huang, Ping et al. interocular Asymmetry of the Visual Field Defects in Newly Diagnosed Normal-tension Glaucoma, Primary Open-angle Glaucoma, and Chronic Angle-closure Glaucoma. J Glaucoma. 2013; 4(1):12.
18. Jerndal T, Lundstrom M, 330 Trabeculectomies: A long term study (3 yrs – 5 yrs 6 months). ActaOphthalmologica 1980; 58: 947 – 56.
19. D'Ermo F. A critical analysis of the long term results of Trabeculectomy. Am J Opthalmol 1979; 88: 829-35.71.
20. Tornqvist G, Drolsum LK. Trabeculectomies. A long term study. Acta Ophthalmol 1991; 69: 450-454.
21. Mictz H, Raschka B, Kriegelstein GK. Risk factors for failures of trabeculectomies performed without anti metabolites. Br J Ophthalmol 1999; 83: 814-821.
22. Popovic V, Sjostrand J. Long term outcome following Trabeculectomy. Acta Ophthalmologica 1991; 69: 299-304.
23. Mills KB. Trabeculectomy. A retrospective long term follow up of 444 cases. Br J Opthalmol 1981; 65 : 790-795.
24. Dr. Ashok Kumar Khurana, Dr. Yogesh, Dr. Archana. A comparative Study of Combined Small Incision Cataract Surgery with Sutureless Trabeculectomy Versus Trabeculectomy Using W shaped Incision. AIOC 2010 PROCEEDINGS.

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