

Study on long term clinical outcome of Trabeculectomy

Dr.Ravikiran.P¹, Dr.Nageswara Rao.U²

¹Associate Professor, ²Professor&Head, Department of Ophthalmology, Dr.PSIMS&RF, DrNTRUHS.,
Chinoutpally, India

Abstract: Trabeculectomy is glaucoma filtration surgery that lowers Intra-Ocular Pressure(IOP). The indications include all glaucomas. There are variations in the procedure, pre and post operative management, and results vary among different centers and surgeons. The indications of trabeculectomy are changing in recent years, especially in primary and secondary open angle glaucomas. The clinical outcome of trabeculectomy is affected by the indications for surgery, intraocular inflammation, and antiglaucoma medication use. Our study aims to study the longterm clinical outcome of trabeculectomy in patients with various types of glaucoma s. This retrospective observational study was conducted on 63 eyes of 54 patients which underwent trabeculectomy with more than 3 months post-operative duration. All the eyes underwent clinical examination, and glaucoma evaluation .The pre and post-operative details were retrieved from patient records. Overall success rate of trabeculectomy in long term was 76.19%.

Key words: Trabeculectomy, Glaucoma, indications of trabeculectomy, Clinical outcome, success rate, failure rate, factors influencing outcome.

Date of Submission: 31-05-2018

Date Of Acceptance: 16-06-2018

I. Introduction

Trabeculectomy is glaucoma filtration surgery that lowers Intra-Ocular Pressure(IOP) by creating a stable surgical fistula, protected by a superficial sclera flap, to allow aqueous outflow from the anterior chamber to the sub-Tenon space. Introduced in the late sixties of last century this procedure replaced the fenestration procedures (eg.Iridencleisis etc) because of its better safety and lesser complications¹. However, the variations in the procedure, pre and post operative management, and results vary among different centers and surgeons²⁻⁷.

The indications include all glaucomas (Primary, Secondary and congenital) where maximum medical therapy with topical antiglaucoma medications were ineffective in controlling IOP to desirable levels decided on a case to case basis in open angle glaucomas and where peripheral anterior synechiae (usually more than 180° angle) preclude adequate drainage of aqueous humor in angle closure glaucomas. With the advent of many effective antiglaucoma medications, especially the topical carbonic anhydrase inhibitors and prostaglandin analogues, the indications of trabeculectomy are changing and the number of eyes requiring trabeculectomy is showing a decline in recent years, especially in primary and secondary open angles^{8,9}. While the safety of trabeculectomy, especially with antimetabolites during surgery is being questioned, alternative surgeries like glaucoma drainage devices and Viscocanalostomy are also suggested as alternatives to trabeculectomy^{10,11,12,13}.

There are many variations in the technique of trabeculectomy like use of limbal based or fornix based conjunctival flaps, traction sutures application to superior cornea or superior rectus tendon, the shape of sclera flap can be triangular, rectangular or trapezoid, the size of scleral flap may vary, the anti metabolites may be used or may not be used, the sclerectomy may be performed by using Kelly's Punch or surgical knife, peripheral iridectomy may or may not be performed, the sutures applied to the scleral flap may be fixed or adjustable, the conjunctival sutures may be continuous, intermittent or purse-string, and finally conjunctiva can be sutured into corneal grooves^{14,15}. Likewise, post operative management also is different and individualized depending on the post-operative condition of the eye and complications. The use of ocular massage, 5-Fluro Uracil subconjunctival injection, Subconjunctival steroid injection, needling of the bleb, systemic steroid usage, and finally surgical repair are all chosen by the surgeons based on the post-operative condition of the eye, experience and confidence of the surgeon in using a particular therapy or procedure^{14,15}.

II. Material And Methods

Material and Methods

Aim of the study: To study the longterm clinical outcome of trabeculectomy in patients with Glaucoma

Objectives: 1) to observe the relation between indications and clinical outcome of trabeculectomy in patients with glaucoma

2) to observe the relation between pre operative condition of the eyes and clinical outcome of trabeculectomy and

3) to analyse the factors associated with the clinical outcome of trabeculectomy.

Study Design: Retrospective Study

Subject Selection: we evaluated the outcome of trabeculectomy in 63 eyes of 54 patients who attended the glaucoma clinic in our hospital between January 2017 and December 2017

Inclusion Criteria:

- 1) All eyes of patients which underwent trabeculectomy with post-operative period more than 3 months
- 2) All eyes of patients which underwent combined cataract extraction with trabeculectomy with post operative duration more than 3 months

Exclusion criteria:

- 1) eyes which underwent trabeculectomy recently (within last 3 months)
- 2) eyes which underwent subsequent cataract extraction after trabeculectomy
- 3) eyes which underwent vitrectomy before or after trabeculectomy
- 4) patients with age less than 30 years

5) Patients with Neovascular Glaucoma

2.6. Methods:

All patients were investigated after taking proper written informed consent in the following manner.

- 1) Complaints if any
- 2) Date and Place of Surgery
- 3) Detailed Pre-operative history
- 4) Detailed family and personal history
- 5) Details of previous ocular surgery and post-operative treatment history
- 6) Visual Acuity
- 7) Slit Lamp examination
- 8) Intra Ocular Pressure Recording (Goldman Applanation Tonometer)
- 9) Fundus Examination
- 10) Visual Field Analysis (Automated Perimetry) wherever possible
- 11) Gonioscopy (4 mirror Posner Lens)

III. Result

As per the indications for trabeculectomy, the eyes included in the study were classified as

- 1) Open Angle Glaucomas
 - a) Primary Open Angle Glaucoma ----12 eyes
 - b) Secondary Open Angle Glaucomas
 - b.1. Pseudo Exfoliation Syndrome with Glaucoma---- 7 eyes
 - b.2. Pigment Dispersion Syndrome with Pigmentary Glaucoma---4 eyes
 - b.3.(Post traumatic)Angle Recession Glaucoma---1 eye
 - b.4. Phacolytic Glaucoma---5 eyes
- 2) Narrow Angle Glaucomas
 - a) Primary Narrow Angle Glaucoma
 - a.1. Incompletely resolved Acute Primary Angle Closure Glaucoma with high IOP persisting after Laser Peripheral Iridotomy----- 7 eyes
 - a.2. Chronic Primary Narrow Angle Glaucoma with more than 180°PAS----10 eyes
 - a.3. Creeping Angle Closure Glaucoma----6 eyes
 - b) Secondary Narrow Angle Glaucomas
 - b.1. Post Uveitic Glaucomas with PAS—4 eyes
 - b.2. Phacomorphic Glaucoma---- 7 eyes

In a retrospective study, we evaluated the outcome of trabeculectomy in 63 eyes of 54 patients who attended the glaucoma clinic in our hospital between January 2017 and December 2017. Nine patients underwent bilateral trabeculectomy. The patients underwent trabeculectomy with more than 3 months post operative period were included in the study as the postoperative fluctuations were expected to be more during the early post operative period. The post operative period varied from 3 months to 8 years, with 30 eyes having more than 3 years duration. In 57 eyes trabeculectomy was done without antimetabolites. In 6 eyes, antimetabolites were used intraoperatively. All the eyes underwent superior trabeculectomy with superior rectus traction, fornix based conjunctival flap, triangular sclera flap of 3 x 4 mm size, sclerectomy with surgical knife, peripheral iridectomy, and scleral flap closure with 10-0 Nylon sutures (adjustable sutures were used for last 3 years) and conjunctival closure by intermittent sutures. Cataract extraction was either done by conventional ECCE or Small Incision Cataract Surgery. All the surgeries were done in our hospital by faculty. Age of the patients varied from 40 years to 75 years, with most of the patients falling in 50-70 years age. There were 30 male patients and 24 female patients. Bilateral trabeculectomy was done in 5 male patients and 4 female patients. Primary narrow angle glaucoma and Primary Open angle glaucoma were the leading indications for trabeculectomy, with 23 and 12 eyes respectively. In bilateral trabeculectomy patients, Primary open angle glaucoma was the leading indication (4 cases) followed by creeping angle closure glaucoma (2 cases). Secondary open angle glaucomas were indication in 17 eyes and Secondary narrow angle glaucomas were indication in 11 eyes. Cataract extraction with IOL implantation was done along with trabeculectomy (Combined/Triple procedure) in 16

eyes, with Phacolytic glaucoma(5 eyes),Phacomorphic glaucoma(7eyes) and Chronic Primary narrow angle glaucoma with significant cataract (4 Eyes). Pre operative Intraocular pressure varied from 26 mm.of Hg to 60 mm.of Hg. with highest pressures recorded in Phacomorphic, phacolytic and post uveitic glaucomas. Regarding intraocular pressure (IOP), success was defined as lowering the preoperative, maximally treated IOP by more than 20% in addition to a postoperative IOP level lower than 21 mmHg without using further anti- glaucoma medication. Success rate was defined by stabilization of visual acuity and visual field in addition to IOP reduction. Higher success rates were seen in Open angle glaucomas (23 out of 29 Eyes; 79.31%) than narrow angle glaucomas (25 out of 34 eyes; 73.52%).Overall success rate of trabeculectomy in long term was 76.19%. The success rate was higher in eyes that underwent trabeculectomy with postoperative duration less than 3 years(27 out of 33 eyes; 81.81%) than more than 3 years(21 out of 30 eyes; 70%). Open angle glaucomas were leading indication for eyes that underwent trabeculectomy with more than 3 years post operative duration (18 eyes) than narrow angle glaucomas(12 eyes). In 33 eyes with less than 3 years post operative duration 22 eyes had narrow angles and 11 had open angles. History of inflammation prior to trabeculectomy controlled by medication was present in 30 eyes. Flat bleb was seen in 12 eyes. Shallow anterior chamber was seen in one eye. One eye had corneal opacity. The clinical findings in the eyes with successful outcome were analysed further. Most of these eyes had diffuse avascular blebs and somewhat posteriorly located blebs. The peripheral iridectomy was patent in all of them. There were scarce signs of inflammation. The anterior chamber was of normal depth or deep. The eyes that underwent cataract surgery prior to and along with trabeculectomy had uneventful and successful cataract surgery and in the bag IOL implantation. The pupil was round and reactive in most of these eyes except in eyes with pseudoexfoliation. The eyes that did not have successful outcome also were analysed similarly. Most of them had localized vascularized blebs or flat blebs, signs of inflammation were prominent with old keratic precipitates, iris atrophy, sphincter atrophy, posterior synechiae, peripheral anterior synechiae, the anterior chamber was normal or deep, the peripheral iridectomy was blocked in 3 eyes, the posterior chamber IOL was in sulcus in 4 eyes, the PCIOL had dusting in 2 eyes, the pupil was sluggish and irregular in most eyes.

Fig.1. No. of Patients- Gender

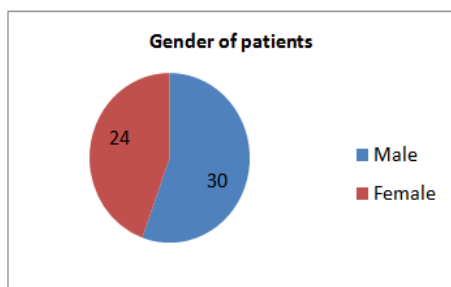


Fig.2. Trabeculectomy Indications-Angle Status

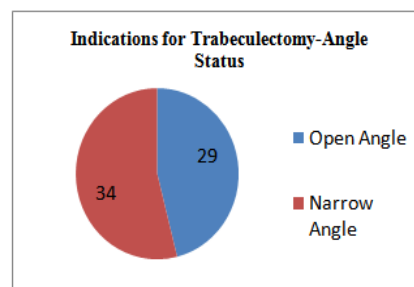


Fig.3. Trabeculectomy Indications-Type of Glaucoma

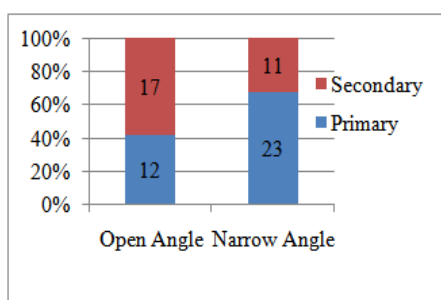


Fig.4. Trabeculectomy Success Rate-Angle Status

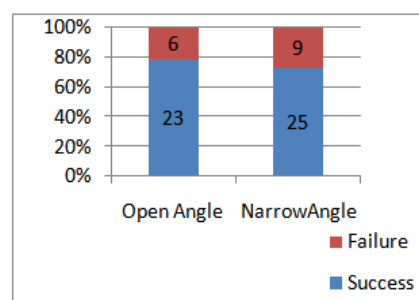


Fig.5. Trabeculectomy Success Rate-Post-op. duration

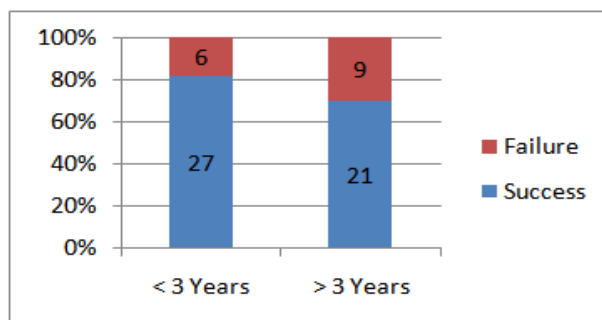
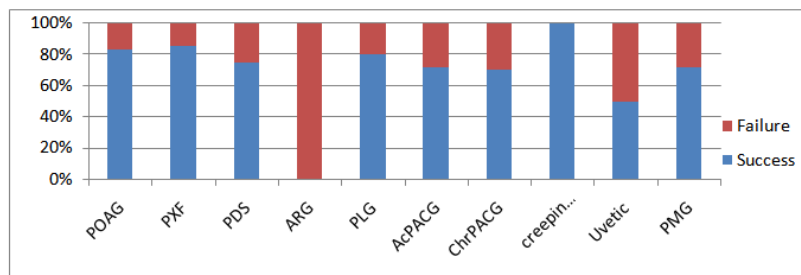


Fig.6. Success Rate – Type of Glaucoma



S.No	Diagnosis	No.of eyes	No.of eyes with Successful Outcome	No.of eyes without Successful Outcome
1	Primary Open Angle Glaucoma	12	10	2
2	Pseudo Exfoliation Syndrome with Glaucoma	7	6	1
3	Pigment Dispersion Syndrome with Pigmentary Glaucoma	4	3	1
4	Angle Recession Glaucoma	1	0	1
5	Phacolytic Glaucoma	5	4	1
6	Acute Primary Angle Closure Glaucoma after Laser Peripheral Iridotomy	7	5	2
7	Chronic Primary Narrow Angle Glaucoma	10	7	3
8	Creeping Angle Closure Glaucoma	6	6	0
9	Post Uveitic Glaucomas	4	2	2
10	Phacomorphic Glaucoma	7	5	2
	Total	63	48	15

IV. Discussion

In our study 63 eyes of 54 patients which underwent trabeculectomy with post-operative periods varying from 3 months to 8 years were examined and results were analyzed as per the study protocol. 30 eyes had more than 3 years post-operative duration. The success rate was defined as lowering the preoperative, maximally treated IOP by more than 20% in addition to a postoperative IOP level lower than 21 mmHg without using further glaucoma medication, stabilization of visual acuity and visual field. These criteria were similar to study conducted by Franz Marie O Cruz et al⁷, but our study considered using any anti glaucoma medication as a failure. As the cataract surgery after a trabeculectomy may affect the function of trabeculectomy and increase the chances of failure¹⁶, those eyes were excluded. Likewise the remodeling and healing that occurs in the immediate post-operative period leads to erroneous assumptions on success or failure of a trabeculectomy¹⁵. The inclusion and exclusion criteria of our study were designed taking this factor into consideration.

In our study, higher success rates were seen in Open angle glaucomas (23 out of 29 Eyes; 79.31%) than narrow angle glaucomas (25 out of 34 eyes; 73.52%). Overall success rate of trabeculectomy in long term was 76.19%. The success rate was higher in eyes that underwent trabeculectomy with postoperative duration less than 3 years (27 out of 33 eyes; 81.81%) than more than 3 years (21 out of 30 eyes; 70%). The common clinical factors for successful outcome in trabeculectomy were absence of pre-operative and post-operative intra ocular inflammation, moderate pre-operative IOP, open angles on Gonioscopy, and lesser or short term of pre-operative topical anti glaucoma medication. The common clinical factors for a failed trabeculectomy were presence of moderate to severe pre-operative and post operative intra ocular inflammation, very high pre-operative IOP, narrow angles on Gonioscopy with extensive angle closure by peripheral anterior synechiae, and long term use of pre-operative topical anti glaucoma medication. Diffuse, posteriorly located and avascular blebs were associated with long term success than localized, anteriorly located and vascularized blebs. The study highlights the importance of intraocular inflammation, angle status, level of IOP, and anti glaucoma topical medication in the outcome of trabeculectomy. The study also highlights the importance of controlling the pre and post-operative intraocular inflammation effectively for a successful, long lasting outcome in trabeculectomy.

In Primary Angle Closure Glaucoma, despite the presence of a patent LPI, most eyes require further treatment to control IOP. Medical therapy fails in most cases, necessitating filtering surgery. Patients risk experiencing further glaucomatous visual damage if this trend is not detected¹⁷. The associated inflammation and peripheral anterior synechiae in these eyes lead to higher propensity for failure of trabeculectomy. In our study narrow angle glaucomas had a success rate of 73.52%. This is comparable to that of similar studies by Mutsch YA² with 76% success rate for standard trabeculectomy but less than that of Koller TL³ with 93.1% success rate for narrow angle glaucoma after 12 months follow-up. The difference could be due to higher follow-up in our study. The success rate of trabeculectomy in Primary open angle glaucoma in our study was 83.33%. This is less when compared to study by Koller TL³, which had a success rate of 92.8%. The success rate of trabeculectomy in Secondary open angle glaucoma in our study was 76.47%. This is comparable to 81.8% success rate for Secondary open angle glaucoma in Koller TL Study³. The success rate for high tension glaucomas seen in primary narrow angle glaucomas and lens

induced glaucomas (Phacomorphic and phacolytic glaucomas) was 73.68%. This is comparable to similar observation by Migdal C⁵. In our study, the overall success rate of trabeculectomy in long term was 76.19%. This is comparable to a study by Franz Marie et al⁷ with 79.8% success rate in 104 patients at one year follow-up. A lower intraocular pressure is associated with reduced progression of visual field defect as observed in EMGT study¹⁸ though AGIS study¹⁹ showed visual field defect progression in 15% of eyes in the group with <18mm of Hg. But the IOP remains the primary modifiable factor in the glaucomas till now. The observation that prior instillation of anti glaucoma medication for longer duration decreasing the efficacy of trabeculectomy is commensurate with similar observations in studies by Broadway DC et al²⁰ and Lavin MJ et al²¹.

Our study has some limitations. There are only 6 eyes in which anti-metabolites were used in our study. So we cannot assess the benefits of anti-metabolites in trabeculectomy. Our study is retrospective study. So there is lower possibility of picking up patients with complete loss of vision and subsequently incapacity to attend reviews. Our study is hospital based study. Most of these patients come for regular eye checkups and some of them require cataract surgery. Further studies with prospective analysis and adequate number of anti- metabolite assisted trabeculectomy are needed for a better analysis of outcomes in trabeculectomy surgery. The indications and need for trabeculectomy are undergoing changes as better and effective anti-glaucoma medications are available with fewer side effects and better patient compliance. However, the role of trabeculectomy in narrow angle glaucomas remains unchallenged. Whatever the indication and method of surgery, the trabeculectomy offers better control of IOP in majority of patients at lesser cost. Our study helps in optimizing the long term results of trabeculectomy and need for regular follow up of patients after the procedure.

V. Conclusion

- 63 eyes of 54 patients which underwent trabeculectomy were examined and results were analyzed
- Post-operative periods varied from 3 months to 8 years
- The indications of trabeculectomy and its' outcome were analyzed.
- Higher success rates were seen in Open angle glaucomas than narrow angle glaucomas
- Higher success rate was in eyes with lesser postoperative duration.
- The common clinical factors for outcome in trabeculectomy were analyzed.
- Pre-operative and post-operative intra ocular inflammation, pre-operative IOP, angle status on Gonioscopy, and duration of pre-operative topical anti glaucoma medication use influence trabeculectomy outcome.
- Overall success rate of trabeculectomy in long term was 76.19%.

References

- [1]. Cairns JE. Trabeculectomy. Preliminary report of a new method. *Am J Ophthalmol* 1968;66:673-8. [PubMed]
- [2]. Mutsch YA¹, Grehn F. Success criteria and success rates in trabeculectomy with and without intraoperative antimetabolites using intensified postoperative care (IPC). *Graefes Arch Clin Exp Ophthalmol*. 2000 Nov;238(11):884-91
- [3]. Koller TL¹, Stürmer J, Gloor B. Risk factors for trabeculectomy failure. [Article in German] *Klin Monbl Augenheilkd*. 1998 Jul;213(1):1-8.
- [4]. Parc CE, Johnson DH, Oliver JE, Hattenhauer MG, Hodge DO. *The long-term outcome of glaucoma filtration surgery. Am J Ophthalmol* 2001; 132: 27-35.
- [5]. Migdal C¹, Gregory W, Hitchings R. Long-term functional outcome after early surgery compared with laser and medicine in open-angle glaucoma. *Ophthalmology*. 1994 Oct;101(10):1651-6.
- [6]. Lichter PR, Musch DC, Gillespie BW, Guire KE, Janz NK, Wren PA et al. *Interim clinical outcomes in the Collaborative Initial Glaucoma Treatment Study comparing initial treatment randomized to medications or surgery. Ophthalmology* 2001; 108: 1943-1953.
- [7]. Franz Marie O. Cruz, MD, and Patricia M. Khu, MD, MS. Predictors for failure of primary trabeculectomy. *Philipp J Ophthalmol*. 2009 Jan-Jun;34(1):8-14.
- [8]. Whittaker KW¹, Gillow JT, Cunliffe IA. Is the role of trabeculectomy in glaucoma management changing? *Eye (Lond)*. 2001 Aug;15(Pt 4):449-52.
- [9]. Bateman DN, Clark R, Azuara-Blanco A, et al. The impact of new drugs on management of glaucoma in Scotland: observational study. *BMJ* 2001;323:1401-2.
- [10]. S Fraser. Trabeculectomy and antimetabolites. *Br J Ophthalmol*. 2004 Jul; 88(7): 855-856.
- [11]. Brian A. Francis, MD, MS; Bryan Hong, MD; Jonathan Winarko, MD; et al. Vision Loss and Recovery After Trabeculectomy- Risk and Associated Risk Factors *Arch Ophthalmol*. 2011;129(8):1011-1017.
- [12]. P K Wishart: Trabeculectomy is not the best surgical option for glaucoma. Presented in 'The Great Debate' at the Royal College of Ophthalmologists Annual Conference, May 2007, Birmingham, UK.
- [13]. Gedde SJ, Schiffman JC, Feuer WJ, Herndon LW, Brandt JD, Budenz DL. *Treatment outcomes in the tube vs trabeculectomy study after one year of follow-up. Am J Ophthalmol* 2007; 143: 9-22.
- [14]. Peng Tee Khaw, Annegret Dahlmann, and Kamiar Mireskandari. Trabeculectomy Technique : The Moorfields Safe Surgery System with new adjustable sutures. *Glaucoma Today* March/April 2005.
- [15]. Ian Murdoch Post-operative management of trabeculectomy in the first three months. *Community Eye Health*. 2012; 25(79-80): 73-75.
- [16]. Rahat Hussain , Shen Liang , Paul J. Foster, Gus Guzzard et al. Cataract surgery after Trabeculectomy: *Arch phtalmol*. 2012;130(2):165-170.
- [17]. Alsagoff Z' Aung T, Ang LP, Chew PT. Long-term clinical course of primary angle-closure glaucoma in an Asian population. *Ophthalmology*. 2000 Dec;107(12):2300-4.
- [18]. Heijl A, Leske MC, Bengtsson B, Hyman L, Bengtsson M. *Reduction of intraocular pressure and glaucoma progression: results from the Early Manifest Glaucoma Trial. Arch Ophthalmol* 2002; 120: 1268-1279.
- [19]. *The AGIS Investigators. The Advanced Glaucoma Intervention Study (AGIS): The relationship between control of intraocular pressure and visual field deterioration. Am J Ophthalmol* 2000; 130: 429-440.
- [20]. Broadway DC¹, Grierson I, O'Brien C, Hitchings RA. Adverse effects of topical antiglaucoma medication. II. The outcome of filtration surgery. *Arch Ophthalmol*. 1994 Nov;112(11):1446-54.
- [21]. Lavin MJ¹, Wormald RP, Migdal CS, Hitchings RA. The influence of prior therapy on the success of trabeculectomy. *Arch Ophthalmol*. 1990 Nov;108(11):1543-8.