

## Original Research Article

# Outcomes of surgical intervention in primary glaucoma at a tertiary eye care centre

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### ABSTRACT

**Background:** Aim of study was to evaluate the outcomes of surgical intervention in diagnosed primary glaucoma cases.

**Methods:** This is a prospective observational study done on 55 cases for evaluating outcomes of surgical intervention in primary glaucoma, conducted in ophthalmology department at a tertiary eye care hospital in central India over a period of 18 months. Standard trabeculectomy surgery was performed for all cases by a single senior surgeon. Medical parameters that were studied as pre-operative and post-operative comparison of visual acuity, Intraocular pressure (IOP), funduscopy, gonioscopy, OCT showing retinal nerve fibre layer (RNFL) thickness, perimetry showing field of vision and post-op complications.

**Results:** This study compares multiple factors in diagnosed primary glaucoma cases to define success of trabeculectomy surgery. Post-operative results showed significant improvement in terms of IOP, visual field index (VFI), UCVA and BCVA, gonioscopy, fundus examination, RNFL thickness on OCT. After taking into consideration all these factors pre and post-operatively, success rate of trabeculectomy evaluated at 6 monthly follow up came out to 87.27%, which includes 52.72% cases showing complete success and 34.54% cases showing qualified success, while remaining 12.72% cases showed failure due to complications like leaking bleb with hypotony, bleb failure, iridodialysis and persistent angle closure where post-op IOP control was not achieved, leading to failure of filtration.

**Conclusions:** Trabeculectomy is fairly a successful surgical management to achieve IOP control and to halt the progression of glaucomatous optic neuropathy, also to prevent further deterioration of vision and field changes in diagnosed Primary glaucoma in the short to medium term follow-up.

**Keywords:** Intraocular pressure, Primary glaucoma, Retinal nerve fibre layer, Secondary glaucoma, Trabeculectomy

### INTRODUCTION

Glaucoma is a leading cause of irreversible blindness worldwide.<sup>1</sup> World Health Organization statistics, published in 1995, says that glaucoma accounts for blindness in 5.1 million persons, or 13.5% of blindness worldwide. By definition, Glaucoma is an optic neuropathy occurring due to progressive damage by apoptosis to retinal ganglion cells (RGCs), which results

in characteristic cupping of the optic nerve head (ONH) and corresponding visual field defects with most common modifiable risk factor being Intra-ocular pressure (IOP). Despite huge research, the mechanisms underlying glaucomatous optic neuropathy (GON) is still unclear, it is hypothesized that lamina cribrosa is the primary site of injury, and raised intraocular pressure (IOP) is a major risk factor, though other risk factors are also postulated.<sup>2</sup> Studies have postulated that degenerative changes in the

optic nerve fibres results in cupping at the optic nerve head, a characteristic appearance of cupped optic disc due to pressure exerted at the weakest point-lamina cribrosa.<sup>3</sup> The biological basis of glaucoma is still poorly understood and the factors contributing to its grave progression have not been fully enumerated.<sup>4</sup>

Glaucoma therapy is primarily based on the disease monitoring to prevent glaucoma progression and stabilization of visual functions by maintaining target IOP because every 1 mm Hg IOP decrease reduces glaucoma progression risk by 10%.<sup>2</sup> Target IOP can be achieved with anti-glaucoma medications or glaucoma surgery. Initially, drug therapy is tried in all cases, but when even multiple drug therapy is unable to maintain target IOP, surgery is the preferred management for which the standard procedure is trabeculectomy. Currently, glaucoma surgery has become a method of choice, even if glaucoma is newly diagnosed to adequately control IOP and thus halting glaucoma progression. Principally, trabeculectomy creates a drainage pathway for aqueous from the anterior chamber into the subconjunctival spaces through a sclerostomy opening and that requires full thickness penetration of the Trabecular meshwork under a partial-thickness scleral flap to be created as limbal based or fornix based incision.<sup>5</sup>

## METHODS

This was a prospective longitudinal observational study done at Tertiary Eye care Hospital-Shri Vasantrao Naik Govt. Hospital in Yavatmal district of central Maharashtra from 01<sup>st</sup> March 2020 to 31<sup>st</sup> August 2021 for 18 months. Written informed consents were obtained from all study patients in accordance with the declaration of Helsinki. Patients fulfilling inclusion criteria, attending Ophthalmology OPD were included. Diagnosed primary glaucoma patients with age >18yrs who were willing for trabeculectomy as surgical intervention were included in the study and any type of secondary glaucoma were excluded. Simple random sampling were used.

### *Diagnostic criteria for primary glaucoma*

Primary Open Angle Glaucoma (PAOG): A patient having glaucomatous field defects with glaucomatous optic disc changes with or without intra-ocular pressure of more than or equal to 22 mm Hg in the presence of an open angle on gonioscopy in either eye.

Primary Angle Closure Glaucoma (PACG): A patient having glaucomatous field defects with glaucomatous optic disc changes with or without intra-ocular pressure of more than or equal to 22 mmHg, in the presence of occludable angle or closed angle on gonioscopy in either eye. But, if the visual field assessment was difficult, clinical symptoms suggestive of acute congestive glaucoma (painful loss of vision, intense redness, photophobia, watering, similar past attack of acutely

rising severe eye pain with headache, nausea and vomiting) along with significantly raised IOP (usually >30mmhg) and closed angle on gonioscopy were the criteria to define PACG.

Exclusion of secondary glaucoma: Patients having raised IOP, retinal/optic disc changes and visual field defects suggestive of glaucoma along with evident ocular comorbid condition which is known to increase IOP viz. Hyper-mature senile cataract-morgagnian variety, chronic iridocyclitis, intra-ocular tumor, vitreous haemorrhage, were diagnosed as secondary glaucoma.

### *Medical parameters to be observed during this study*

#### *Pre-operative assessment*

At the initial examination prior to surgery, the patient general health and medical history noted, including any past treatment or ocular surgeries.

Uncorrected visual acuity for distance (UCVA) and best corrected visual acuity for distance (BCVA) using a Snellen chart.

IOP using the Goldman applanation tonometry: Average of 3 readings noted (if the difference between the first two readings was  $\geq 3$  mmHg, then a third reading was taken), in the morning hours between 8:00 and 10:00; 1) Fundus examination by direct ophthalmoscopy and indirect ophthalmoscopy with 20D lens; 2) Lens and fundus photography; 3) Gonioscopy (Goldman 3 mirror gonioscope); 4) Visual field examination (Humphrey 24-2 FDT perimeter); 5) OCT for Retinal nerve fibre layer thickness (RNFL).

#### *Post-operative assessment*

Similar factors assessed on post-op day 1, day 8, 1month, 3months, 6 months, and surgery related complications noted.

### *Criteria for trabeculectomy success vs failure*

Complete success: Post-op IOP control achieved as 20% reduction in IOP from baseline or absolute IOP>5mmHg and <21mmhg, without support of anti-glaucoma drugs and no significant post-op complications.

Qualified success: Post-op IOP control achieved as 20% reduction in IOP from baseline or absolute IOP>5mmHg and <21mmhg, with support of anti-glaucoma medications, with or without mild post operative complications not hindering with vision or IOP.

Failure: Those cases in which post-op IOP control (20% reduction in IOP from baseline or absolute IOP>5mmHg and <21mmHg, was not achieved despite use of maximally tolerated anti-glaucoma therapy, or those who

warrants repeat trabeculectomy or alternative glaucoma surgery.

## RESULTS

The above table 1 shows that most of the patients (58.18%) were from age group between 55 to 64 years, 27.27% belong to 65 to 74 years age group and 14.54% to 45 to 54 years age group.

**Table 1: Distribution of patients according to age.**

Age group (years)	No. of cases	Percentage
45-54	08	14.54
55-64	32	58.18
65-74	15	27.27
<b>Total</b>	<b>55</b>	<b>100</b>

The above table 2 depicts, number of female cases of primary glaucoma were more than males (F:M = 3.58).

**Table 2: Distribution of patients according to gender.**

Gender	No. of cases	Percentage
Male	12	21.81
Female	43	78.18
<b>Total</b>	<b>55</b>	<b>100</b>

IOP control was adequately achieved in 6 months follow-up in majority of cases with 30% reduction from baseline (mean pre-operative IOP = 27.54 mmHg to mean post-operative IOP = 19.23 mm Hg) (Table 3).

**Table 3: Comparison of IOP and RNFL between the Pre-op and post-op cases.**

Parameter	Pre-op (Mean ± SD)	Post-op (Mean ± SD)	P-value
IOP	27.54±4.98	19.23±4.10	0.001
RNFL	66.23±19.15	76.31±23.18	0.001

Mean pre-operative RNFL thickness of 66.23micron meters increased to mean of 76.31micron meters on 6<sup>th</sup> monthly follow up post-operatively which shows statistically significant difference with p value <0.05 (Table 3).

Visual acuity showed improvement after trabeculectomy in maximum cases as Un-corrected visual acuity (UCVA) improved in 28 cases out of 55 and UCVA remained stable in 25 cases. Similarly, best corrected visual acuity (BCVA) also improved in 37 cases and 15 cases showed stable BCVA (Table 4 and 5).

Significant improvement in noted in VFI among 32 cases out of 55 (58.18%) and no further worsening in visual field among 5 cases (9.10%) over 6months follow-up (Table 6).

**Table 4: Distribution of patients according to UCVA improvement in post-op cases.**

UCVA	No. of cases	Percentage (%)
Improved	28	50.90
Stable	25	45.45
Worsened	02	3.65
<b>Total</b>	<b>55</b>	<b>100</b>

**Table 5: Distribution of patients according to BCVA improvement post-op cases.**

BCVA	No. of cases	Percentage (%)
Improved	37	67.27
Stable	15	27.27
Worsened	03	5.46
<b>Total</b>	<b>55</b>	<b>100</b>

**Table 6: Distribution of patients according to visual field improvement in post-op cases.**

Visual field index (VFI)	No. of cases	Percentage (%)
Improved	32	58.18
Stable	05	9.10
Cannot be evaluated	18	32.72
<b>Total</b>	<b>55</b>	<b>100</b>

Fundus was examined for all cases as a baseline investigation pre-operatively and compared with the post-operative fundus which showed no significant change in terms of optic nerve head cupping, neither worsening nor any improvement.

Gonioscopy performed post-operatively showed that except 1 case in which angle could not be visualised due to hazy media, 94.54% patients showed open angle, in contrast to pre-op cases in which, only 41 cases were Open angle (Table 7).

**Table 7: Distribution of patients according to gonioscopy.**

Gonioscopy	Pre op	Post op
Open angle	41	52
Angle closure	03	02
Cannot be assessed due to corneal oedema	11	01
<b>Total</b>	<b>55</b>	<b>55</b>

Out of 55 trabeculectomy, 45 surgeries in majority were uneventful, while 10 cases reported certain complications, including 3 cases (5.45%) of mild to moderate post-op uveitis, 2 cases (3.63%) of leaking bleb with hypotony, 1 case (1.81%) each of bleb failure, hyphaema, iridodialysis, overhanging bleb and persistent angle closure which subsequently lead to failure of

filtration, thus post-operative IOP was not controlled in those cases (Table 8).

**Table 8: Distribution of patients according to post-op complications.**

Post-op complications	Frequency	Percentage
Bleb failure	01	01.81
Hyphaema	01	01.81
Iridodialysis	01	01.81
Leaking bleb with hypotony	02	03.63
Overhanging bleb	01	01.81
Persistent angle closure	01	01.81
Post-op anterior Uveitis	03	5.45
Nil complications	45	81.81
<b>Total</b>	<b>55</b>	<b>100</b>

Finally, success rate of trabeculectomy evaluated at 6 monthly follow up is 87.27%, which includes 52.72% cases showing complete success and 34.54% cases showing qualified success and 12.72% cases of failure (Table 9).

**Table 9: Distribution of patients according to success of trabeculectomy.**

Success of surgery	Frequency	Percentage
Complete success	25	52.72
Qualified success	19	34.54
Failure	07	12.72
<b>Total</b>	<b>55</b>	<b>100</b>

## DISCUSSION

Glaucoma is a progressively blinding disease, thus, slowing the progression and thus preservation of the existing vision is the main goal for glaucoma treatment to improve the quality of life.<sup>6</sup> Control of increased IOP is the only proven method to control glaucomatous progression as it is the only known modifiable risk factor.<sup>7</sup> Results from several multicentric clinical trials have successfully demonstrated the benefit of IOP reduction in preventing the further vision loss and slowing the disease progression over years with surgical treatment and the standard surgery being trabeculectomy.<sup>7</sup> Trabeculectomy is conventionally the most commonly performed incisional surgery that consists of excision of a small portion of the trabecular meshwork and its adjacent corneoscleral tissue to make a new drainage route for aqueous humour from anterior chamber to underneath the conjunctiva-subconjunctival space, where aqueous can be absorbed via episcleral plexus of veins.

A study to provide data on long-term results of trabeculectomy performed in open angle in 59 eyes of 51 patients in Medical University of Lodz for 10 years showed successful IOP control in 91% cases and

concluded that trabeculectomy is effective surgery for open angle glaucoma.<sup>8</sup> Study on efficacy trabeculectomy seems to be the most effective surgical procedure for reducing IOP in patients with open-angle glaucoma but it was associated with a higher incidence of complications compared with NPGS.<sup>9</sup> Another study by Gilmour et al on visco-canalostomy vs trabeculectomy for primary open angle glaucoma concluded trabeculectomy to be more effective at lowering IOP in POAG patients.<sup>10</sup> A study by Awoyesuku EA on outcome of trabeculectomy in advanced glaucoma in a tertiary eye hospital in Rivers State, Nigeria on 13 eyes of 10 patients resulted in a 58.24% drop in IOP over 6 months with mean visual acuity maintained at pre-op levels after 6 months follow up, hence, study inferred trabeculectomy as effective and safe surgical modality even in advanced glaucoma.<sup>11</sup>

Factor lacking in our study is the long term or life-long follow-up which is required to evaluate the complete safety and efficacy of trabeculectomy as glaucoma is known to be a progressively blinding disease. Also, bleb fibrosis which is a delayed complication of trabeculectomy, can lead to failure of filtration and subsequently rising IOP causes further damage.

## CONCLUSION

Trabeculectomy is one of the safe and effective surgical method with considerably good results and minimal complications when performed by experienced hands. Trabeculectomy effectively attains the IOP control in order to halt the progression of glaucomatous optic neuropathy, and thus prevents further deterioration of visual acuity and visual field changes in diagnosed Primary glaucoma cases in the short to medium term follow-up. It not only saves the vision but also improves the quality of life of glaucoma patients by rescuing the existing vision.

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